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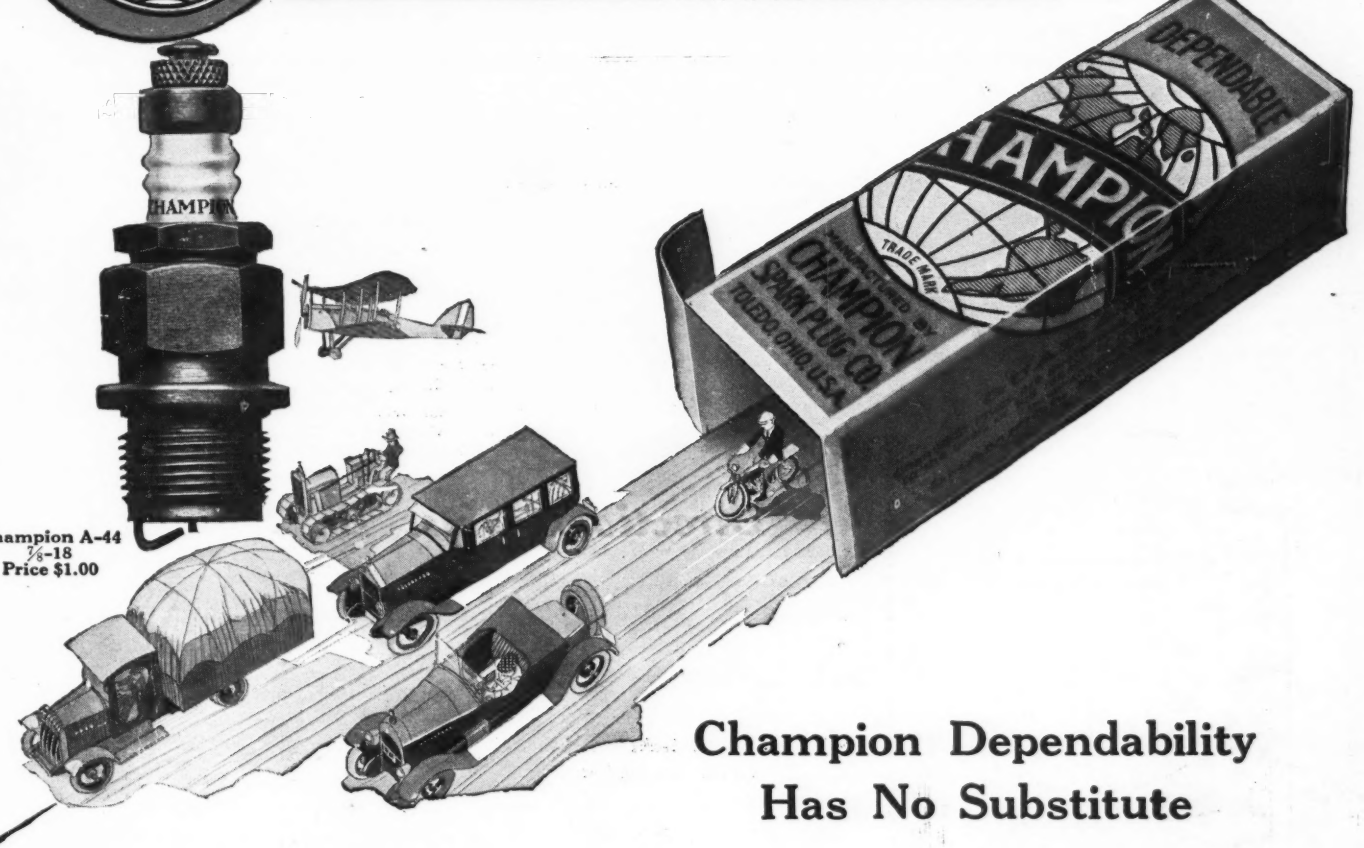
# MOTOR AGE

Volume XXXVII  
Number 2

PUBLISHED WEEKLY AT THE MALLERS BUILDING  
CHICAGO, JANUARY 8, 1920

Twenty Cents a Copy  
Three Dollars a Year

## Champion Dependable Spark Plugs



Champion A-44  
3/8-18  
Price \$1.00

### Champion Dependability Has No Substitute

**M**ORE than half of all the manufacturers building all types of gasoline engines, equip their products at their factories with Champion Dependable

Spark Plugs. This is the public's guide and protection in selecting spark plugs for their cars. Avoid substitutes—look for the name "Champion" on the Insulator.

Now is the time for dealers to make sure their stock of Champion Dependable Spark Plugs is complete. Go over your stock today.

**Champion Spark Plug Company, Toledo, Ohio**  
Champion Spark Plug Company, of Canada, Ltd., Windsor, Ont.

FOUR DAY BOOK  
NOT RENEWABLE

# JOHNSON'S FREEZE-PROOF

is easy to use—is non-inflammable—inexpensive and guaranteed. It does not evaporate, so one application will last all winter.

## Read This Guarantee

We guarantee that Johnson's Freeze-Proof has no more effect than water on the metals of the radiator or on rubber.

If Johnson's Freeze-Proof is used according to the simple directions in the proportion shown on our scale, it will absolutely protect your radiator against damage from freezing.

We do not guarantee Johnson's Freeze-Proof when used in cars with aluminum manifolds, although it has been used satisfactorily in hundreds of such cars. Water alone often has an injurious effect on aluminum.

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I had Freeze-Proof in the radiator while the thermometer registered 22 below zero. No injury was done.—REV. F. ADIX, Rush Center, Kans.

We used several cases of your Freeze-Proof last winter with the very best of results.—CITY GARAGE OF TYLER, Tyler, Texas.

I used Johnson's Freeze-Proof last winter and had no trouble.—L. K. LOY, St. Louis, Mo.

I have used Johnson's Freeze-Proof in my Overland car all

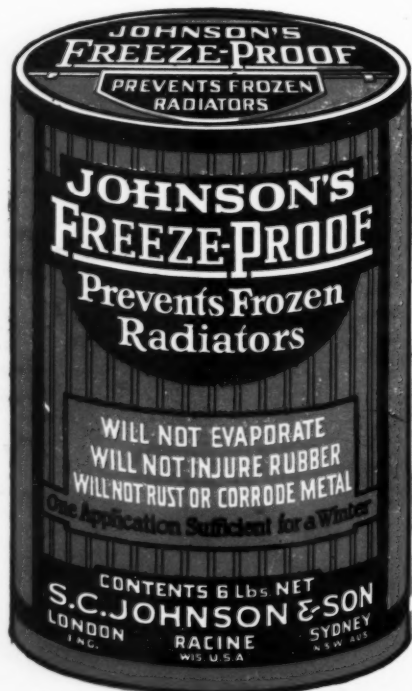
winter and have had absolutely no trouble. I have no hesitancy in recommending Johnson's Freeze-Proof.—J. VAN NORMAN, Asst. Business Manager, The Herald, Grand Rapids, Mich.

Johnson's Freeze-Proof is the best insurance one can have in the cooling system of any car.—C. W. MALLORY, Georgetown, Ky.

I used Johnson's Freeze-Proof last winter with satisfaction. I know it won't freeze at 28 degrees below zero.—DR. F. W. COLLINS, D. V. M., Madison, Nebr.

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Johnson's Freeze-Proof will give perfect satisfaction if used according to directions on label. It requires just a little time and care to comply with these instructions—then your worry is over for the whole winter.

1st.—Clean all dirt, scale, sediment, etc., from the cooling system by using a boiling solution of ordinary washing soda. Flush out thoroughly.

2nd.—Repair all leaks. Unless hose connections are new, replace them. Tighten all packing and gaskets.

## \$1.50 Protects a Ford

One package of Johnson's Freeze-Proof (Cost \$1.50) will protect a Ford to 5 degrees below zero, and two packages to 50 degrees below zero. For larger radiators or to protect to a lower temperature, use additional Freeze-Proof according to the scale on the package.

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ESTABLISHED 1882



# MOTOR AGE

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# "NORMA" PRECISION BALL BEARINGS

(PATENTED)



One of the few things not affected by the World War or by the conditions which have followed—is "NORMA" Quality. Prices of materials and labor have changed. But in all the essentials that define value, "NORMA" standards have been inflexibly maintained—regardless of cost.

See that your electrical apparatus is "NORMA" equipped.



## THE NORMA COMPANY OF AMERICA

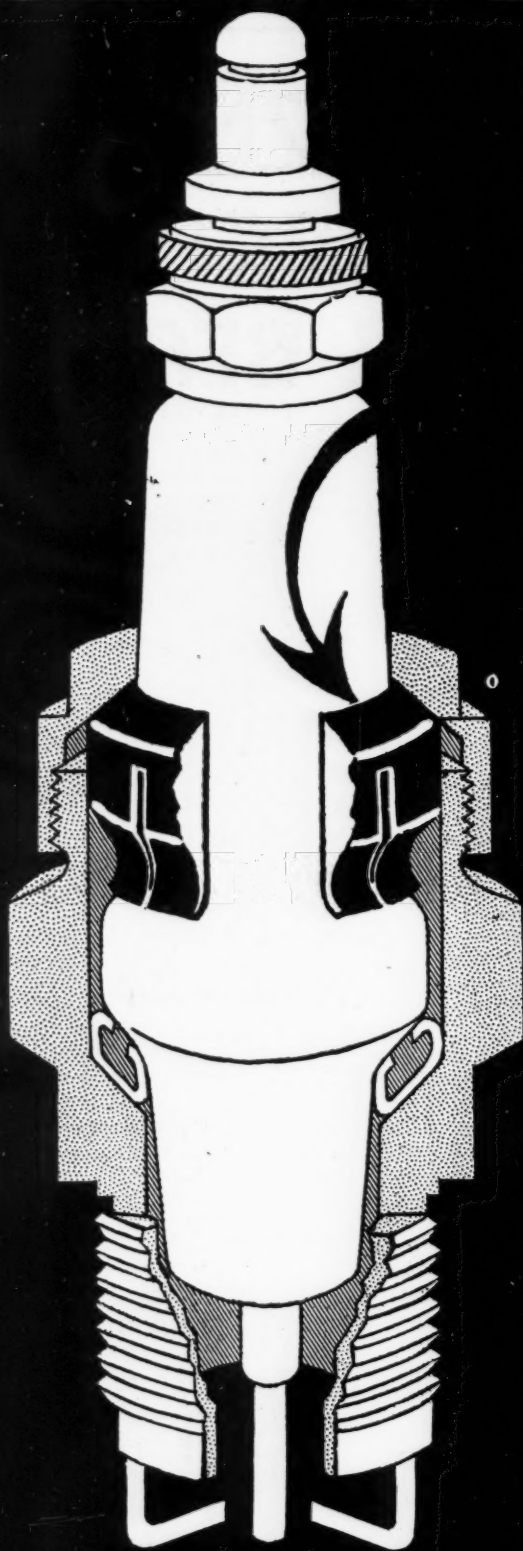
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NEW YORK

Anable Ave., Long Island City

New York

Ball, Roller, Thrust and Combination Bearings



## Featuring

### Unbreakable Porcelains

The great enemy of the spark plug has always been contraction and expansion of metal parts, causing porcelain breakage, and every manufacturer has been seeking for years ways and means for eliminating this difficulty.

In the HERCULES line we are now offering the first practical and mechanical means of eliminating breakage through excessive tightening, expansion of metal parts or other strain and this patented spring gland construction together with loose-assembly of internal center stem has met and overcome every obstacle.

### THE PORCELAINS

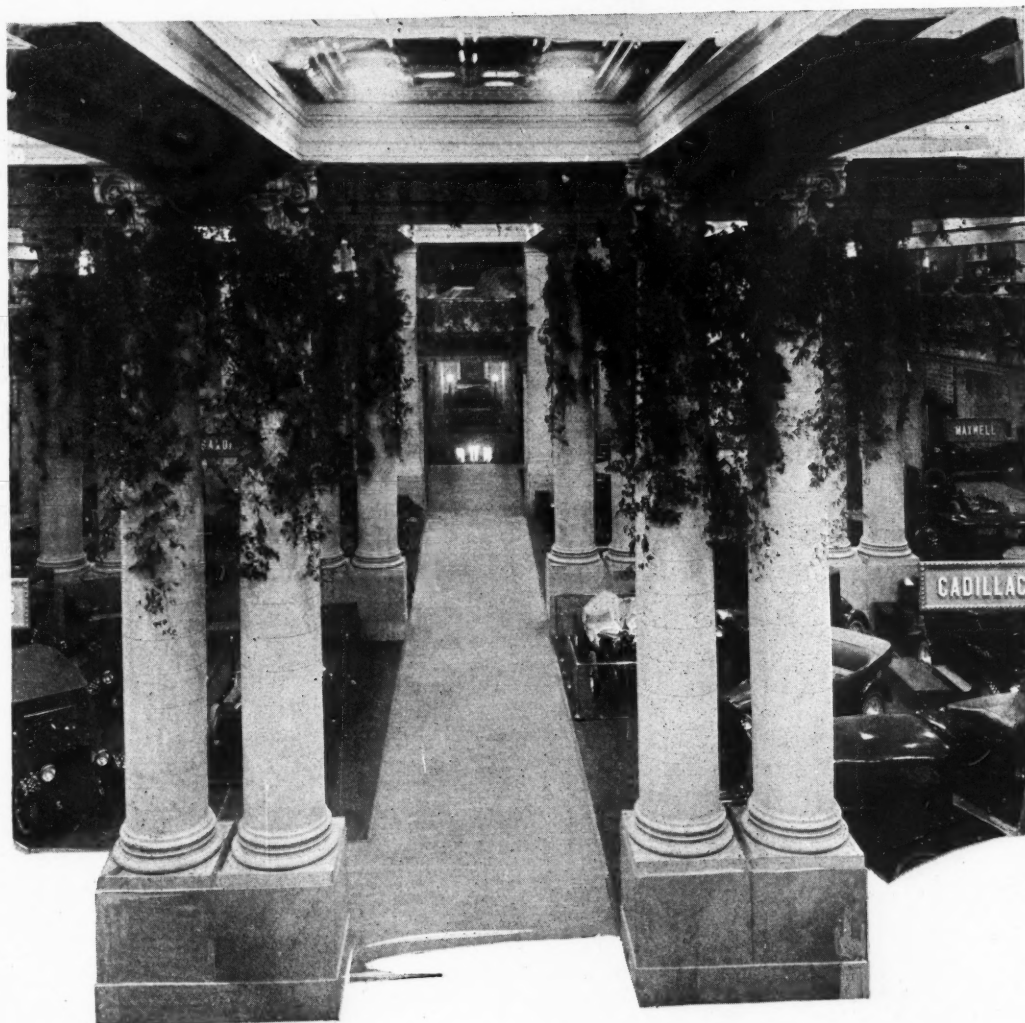
employed in the HERCULES line more closely approximate stone than any substance which has ever been used. They are oversize, unglazed and show a tensile strength which has never been approximated in any insulator ever previously employed and have enabled us to adhere to the petticoated core without danger of breakage under the strain and tremendous compression generated in the modern high speed motor.

### EVERY PHASE

of HERCULES construction is fully covered by patent and can be secured in no other line. For tractors, commercial vehicles, aeroplanes, marine motors and other cases where conditions of service are extreme, the HERCULES stands without equal.

**HERCULES  
SPARK PLUGS  
STRICTLY A QUALITY PRODUCT  
ECLIPSE MANUFACTURING COMPANY  
INDIANAPOLIS INDIANA . U. S. A.**

# MOTOR AGE



## New York Show Promises Big Business

Popular and Trade Attendance to Break Records and New  
Cars Show Easier Service Features

BY DARWIN S. HATCH  
(Managing Editor, Motor Age)

NEW YORK, Jan. 3—The automobile industry's first exhibition of new cars for 1920, which opened at the Grand Central Palace this afternoon, gives promise that there will be many new car models offered to the trade. There are a score or more manufacturers exhibiting either new body styles, or re-designed chasses, which make their first appearance. There are several in which the design has been altered to an extent that makes them truly post-war models, and show indications of the effect of war experience on designs.

Among these in particular should be mentioned the new Studebaker Six, the Saxon, Paige, Marmon, Premier, Mitchell, and, of course, the new Nash Four.

There are also in outside exhibits at the hotels, five new cars, manufactured by new concerns. These are not at the Palace because that space is parcelled out on the basis of previous production, which leaves the new manufacturers out in the cold. Among the cars of new make exhibited is the LaFayette, which is the product of a concern headed by Charles A.



Nash, and is the design of D. McCall White and Howard, both formerly engineers of the Cadillac company, and who to an extent were responsible for the Cadillac Eight.

Harry Stutz's new production, the H. C. S., makes its bow to the public at the Astor, as does the Ferris, a local production. The Martin Wasp at the Commodore, and the Argonne are also eastern products.

There is a large number of new designs, whose changes are limited chiefly to body construction, and contour. There are also a few new body types.

The Palace Show is not as colorful as we have been used to. There are very few brilliant spots among the exhibits. As a rule, blue-blacks and green-blacks are the color schemes, and there are

*Pessimist prophets predicted two years ago that we had seen the last of the automobile shows, that the interest was falling off and that they had outlived their usefulness. Last year's overwhelmingly successful exhibitions not only at Chicago and New York, but also in every city of size throughout the country, proved those predictions unfounded. The opening day of this year's displays seems to add any proof that may be necessary that the popular interest, as well as dealer attendance, is to be as great this year, and probably for an indefinite number of years in the future, as it ever has in the past. The first day's attendance of any show is not a direct evidence of popularity. Opening night usually has some "paper" in it, but a full attendance at the inaugural session may be taken to mean a good run. Nevertheless, the jam when the doors were thrown open at 2 o'clock Saturday afternoon, exceeded all records of the past, and this may be taken as a good omen of the success, from an attendance standpoint, throughout the week. What, however, is of more importance, the percentage of dealers and distributors seems to be greater this year than has been noted in the past and that means a bigger and better business for all concerned.*

also a great many dark soft-toned greys and browns. No striking color combinations are shown.

#### Not Like Last Year

The displays last year were exceptionally colorful, because they were dealer displays and were not limited to factory production in any sense and the dealers

took advantage of the opportunity to show a great many special colors and special body jobs, which would not be financially profitable from a manufacturer's standpoint. The real bright spot in the matter of colors was the corner wherein the Packard and Pierce-Arrow were neighbors.

New designs are to be seen at the exhibits of the Chandler, Mitchell, Liberty, Maibohm, Roamer, Templar, Jackson, Milburn

Electric, Lexington, Briscoe, and Willys-Knight, the latter two also have redesigned their chassis to an appreciable extent. New coupes are to be seen in the Oakland and Chevrolet lines.

Not only at the Grand Central Palace are new things in motordom to be seen. For the first time in a good many years



Corridor in the Palace with new Saxon chassis in the foreground

commercial vehicles are on exhibition simultaneously with the passenger cars. These are being shown in the Eighth Coast Artillery Armory, which, unfortunately, is not very handy to the Palace, a state of affairs which will make visits between two exhibitions somewhat less frequent than they would be otherwise. There are a number of new trucks to be seen, among them the four-cylinder Auto Car, which is an addition to the previous line of two-cylinder trucks characteristic of Auto Car production ever since the industry was young. In addition, the Graham, Clydesdale and the Duplex, the Sterling 5-tonner with its six-speed gear set, are new designs. Three-ton pneumatic tired Packard and

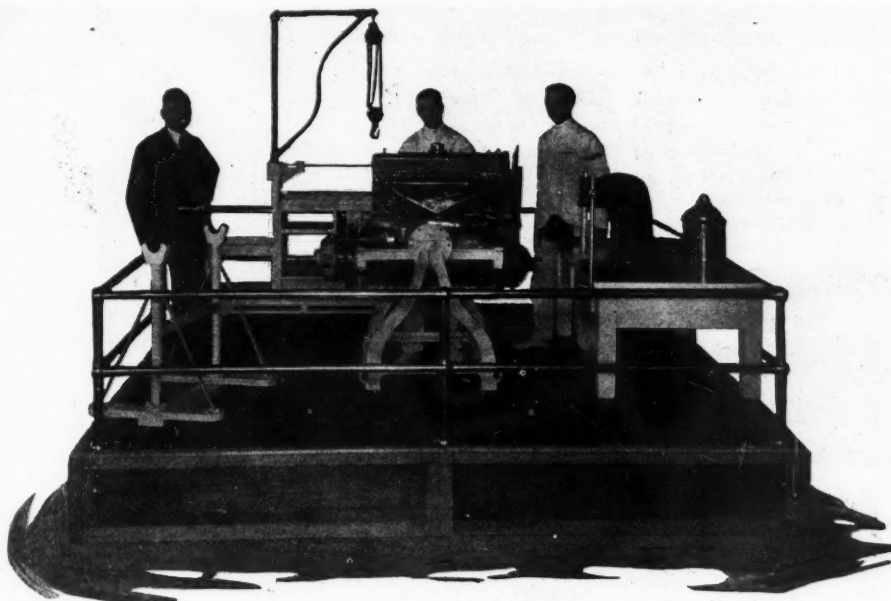
the Ward-La France are also new designs to be seen.

In the matter of the size of the automobile show itself, this also indicated a 50 per cent increase in interest on the

were on display last year. There are eight electrics to be seen, four times as many as shown last year. Eights and twelves are not quite as much in evidence in actual number of cars shown

part of the manufacturer. The total number of exhibitors at the Palace this year is 307, as against a total of 198 last year. The number of car exhibitors has increased to 81 for this year, as against 56 last. Accessory exhibitors are 225 in number, as against 141 a year ago. There is also one motorcycle exhibit.

Six-cylinder cars show an increasing lead over the rest of the field among the exhibits. There are 223 sixes this year, as against 141 last. Incidentally, however, there are 65 fours, 15 more than

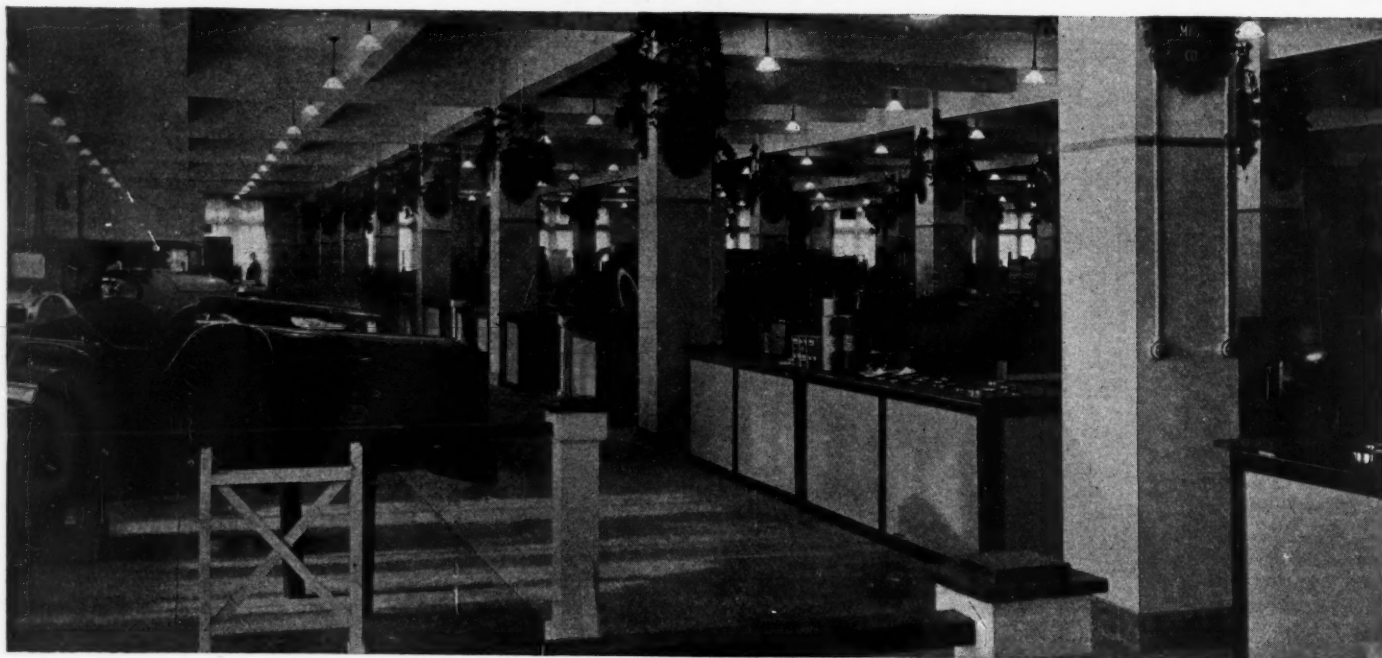


Marmon engine display at the Commodore.



Decorations of the Palace are chiefly trailing vines





A corner of the accessory displays

the total being twenty-nine eights and seven twelves.

There is a slight increase in the number of closed cars, the real change in this situation is the comparison between owner-driven cars and chauffeur-driven cars. If the display at the Palace is

any criterion, the owner-driver is to be catered to in greater measure than formerly. He is the ultimate consumer in 103 of the cars on exhibition, whereas only fifty-eight were sedans or coupes last year. Chauffeurs are provided for in sixteen of the cars this year, and twen-

ty-one last year. The numerical decrease is significant.

The convertible car, that is, the sedan or coupe, which could be turned into an open touring car, or a roadster, by removing a glass top, has almost disappeared. There are only two of them



The trucks on view at the Armory



to be seen, while there are 117 of the fixed top type.

One of the unique displays which should prove of interest to service and repair men is that of the Nordyke & Marmon Co. in its special display at the Commodore. The Marmon company has a crew of three men in the booth who tear down and reassemble a Marmon engine three times a day for the benefit of the crowds.

If there is any one definite feature in the accessory displays, it is the greatly increased extent to which the servicing of cars is being made a feature of the accessory and equipment division. The most complete exhibit is connected with the Marmon private display at the Commodore. At the Palace, also, there are numerous exhibits of apparatus and special tools designed for rendering quicker and better service. These extend all the way from special valve grinders to complete welding outfits mounted on trucks.

Accessibility for easier maintenance and better servicing are the features of several of the newer designs, the Fergus, which appeared several years ago, has re-appeared this year, and the unusual service and maintenance features, such as the oiling arrangements, and so on, are continued. Perhaps there is no better example of the new movement than the later designs for reducing service costs than the new H. C. S., which is

so arranged that all of the units are separately demountable and replaceable, it being even possible to remove the engine without taking off the steering gear.

There is little question that the large attendance at the opening sessions of the New York shows spells success to the future shows of the year. There was some fear that on account of the inability of dealers to get the number of cars they demanded during the past year might have a deterrent effect upon their attending the big exhibits, but apparently this is not the case. The dealers are present at the New York show in even greater numbers than ever before and the atmosphere of business is as noticeable.

#### Dealers After Cars

There is one change, however, from some of the shows of a bye-gone day. The old atmosphere of the company officials trying to line up agencies to handle their car which is a familiar sight to the old-timers at the show is quite absent this year. Instead of the company men trying to get dealers, it is the dealers who are trying to get cars. The factory men, however, are out to get good dealers if they can and are letting no bet be overlooked. The shortage of cars is evidenced by the insistence the makers are laying upon their agencies maintaining adequate service and repair shops.

That the 1920 production of cars will be far beyond that of 1919 is the conclu-

sion one must draw after conversing with various factory representatives at the show. At this time a year ago the factories were in the midst of turning from a war basis to a peace basis and some were even in the midst of fulfilling their war contracts. Now, however, the factories are back to a peace basis and prepared to renew their production just where they left off in 1918.

The coal and steel shortages which threatened to curtail production a few weeks ago, seem to have been weathered. Although most of the factories have used up part of their reserve stocks of these basic materials, they believe that they will be able to get enough to keep them going at top speed for the coming year.

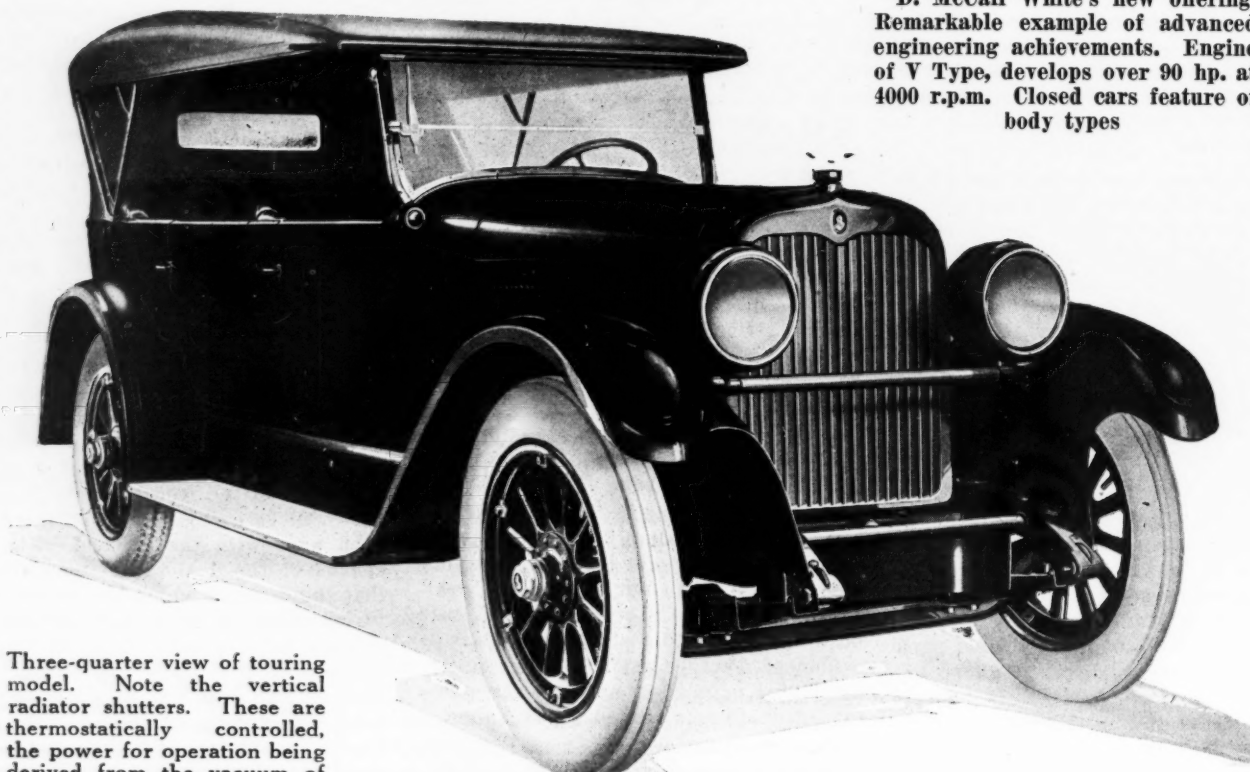
That the shortage of cars will be overcome during the coming year, however, is a different thing. Although the makers have planned for the biggest year of production in the history of the automotive industry, there is little chance they will be able to do much more than keep pace with the demand. The consensus of the dealers at the show was that the demand which has so far manifested itself is only part of the true demand for new cars. Most of the dealers believe that there are thousands of persons who want new cars but who have been deterred from making their wants known merely by the knowledge that there already existed a big shortage.



A part of the Commercial Vehicle Show

# INTRODUCING THE LAFAYETTE—AN EIGHT

D. McCall White's new offering. Remarkable example of advanced engineering achievements. Engine of V Type, develops over 90 hp. at 4000 r.p.m. Closed cars feature of body types



Three-quarter view of touring model. Note the vertical radiator shutters. These are thermostatically controlled, the power for operation being derived from the vacuum of the intake valve

**A**NNOUNCED several months ago, but not in detail, the LaFayette car, which is the production of D. McCall White, formerly the chief engineer of the Cadillac Motor Co., is now ready and is presented herewith in its every detail to MOTOR AGE readers. This week at the show in New York the LaFayette occupies a position of prominence. Its display at the Hotel Commodore is made particularly attractive in view of the fact that the sedan model on display was driven overland at a rather fast pace.

Closed cars will predominate in the LaFayette line for 1920, since in addition to the touring sedan displayed during the New York and Chicago automobile shows, designs have been approved for a smart appearing limousine and a four-passenger coupe.

## Two Open Models

The open models will be limited to two styles,—a touring car and a torpedo four-seater, the latter being distinguished by lines suggestive of high speed.

While the chassis has the usual road clearance, the design is unusually low, permitting low graceful lines in all bodies. The line of vision of a passenger is approximately that of a person of normal stature walking along the street. The horizontal body lines are straight while the lines in the vertical plane are curves. The radiator and hood are high. A foreign influence is evident throughout. The small wheels and extra-large tires are one of the many examples of the foreign tendency.

## SPECIFICATIONS LAFAYETTE CAR

WHEELBASE—132 in.

ENGINE—Eight-cylinder— $3\frac{1}{4}$  by  $5\frac{1}{4}$  in.

PISTON DISPLACEMENT—348 in.

N. A. C. C. HP. 38.8—Actual 95 hp. at 4000 r.p.m.

HIGH PRESSURE LUBRICATION.

STARTING LIGHTING IGNITION Special Delco system.

SPRINGS—Semi-elliptic with center torque tube drive.

CHANNEL FRAME—6 in. deep.

Generally speaking, the noteworthy characteristics of the LaFayette, inspired for the most part by recent developments in air craft, are as follows:

1. A very simple eight-cylinder engine. The job is notable for its clean design, unusual accessibility and reduction in the number of parts.

2. General use of alloy steel forgings instead of malleable iron castings.

3. Use of alloy steel tubing of large diameter rather than small solid shafts, giving lightness with strength.

4. Use of newly developed aluminum alloys.

5. No driving gears in engine except two small gears for driving distributor.

6. All moving parts enclosed, making them dust and oil proof. For example, the whole cycle of movements, from transmission to rear axle, housed by torque tube.

7. No bent rods.

8. Straight-line drive from engine to rear axle.

9. Simple, dependable lubrication of all chassis parts. Few lubrication points.

10. Use of ball and socket self-adjusting joints on control rods.

Among the many special features which are peculiar to the design are the following:

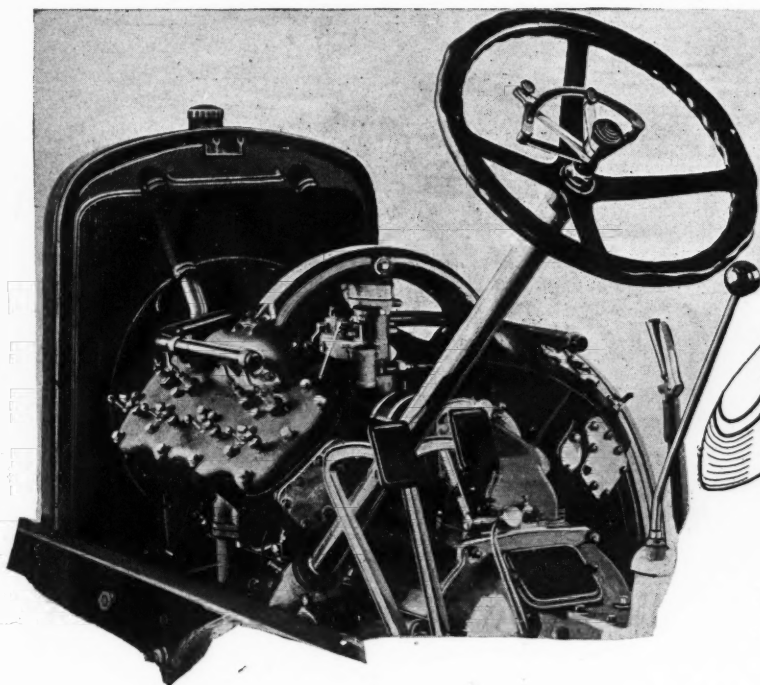
1. Hollow crankshaft of large diameter with a bearing on each side of each crank.

2. Hollow camshaft with sixteen cams.

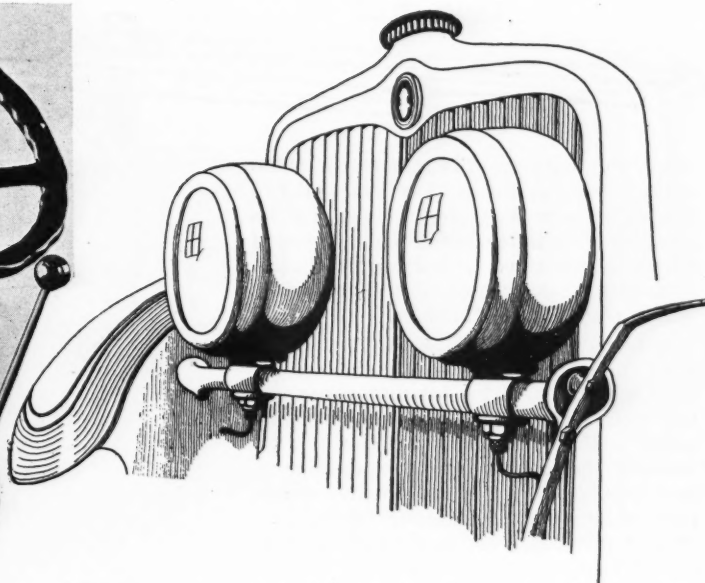
3. Camshaft bearings lubricated by oil under pressure.

4. Valve tappets operate directly on cams without rocker arms, and necessary angle of valves brings the valve ports closer to center of combustion space increasing valve efficiency at high speeds.





Water jackets, intake manifolds and exhaust manifolds integral. Note how exhaust gases are led away from lower side of cylinder block by single connection. Engine suspended at four points.



The mounting of LaFayette headlamps is unique. They are rigidly held with no exposed brackets, on substantial crossbar, ensuring a uniform focus for both lamps.

5. Front end chains adjustable from outside of crank case—a patented device.

6. LaFayette patented dual-action water pump driven by the crankshaft without bearings and requiring no lubrication.

7. Thermostatically controlled air circulation keeps engine cool for quietness while exhaust-heated intake insures proper vaporization of fuel.

8. Vertical radiator shutters thermostatically controlled.

9. LaFayette patented compensated fan drive, without lubrication.

10. LaFayette patented device for removing water and sediment from oil, without removing oil pan or draining oil supply.

11. Pressure relief valve integral with oil pump circulating only oil actually used in lubrication.

12. Front axle of LaFayette design of reversed Elliot type.

13. Exhaust manifolds cast integrally with cylinder blocks. Exhaust gases led away from lower side of each block by a single connection.

14. Torque tube which relieves rear springs of every duty except springing car; prevents brakes from chattering.

15. Rear springs shackles always in tension which tends to eliminate rattle.

16. No slotted links in brake control rods.

17. Pinion and sector type of brake equalizer of dust-proof, fool-proof, construction—a positive me-

chanical device insuring uniform reliability of brake equalization.

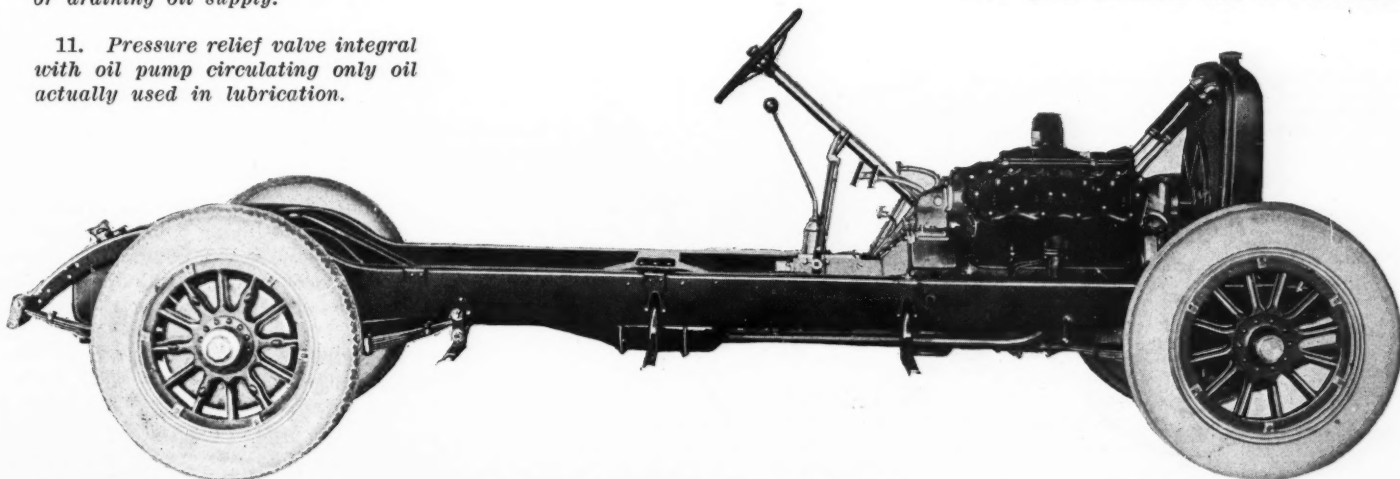
18. Speedometer drive enclosed in transmission.

19. Oil which passes through large, hollow crankshaft tends to cool main and connecting rod bearings as well as lubricate them.

#### Unit Engine Construction

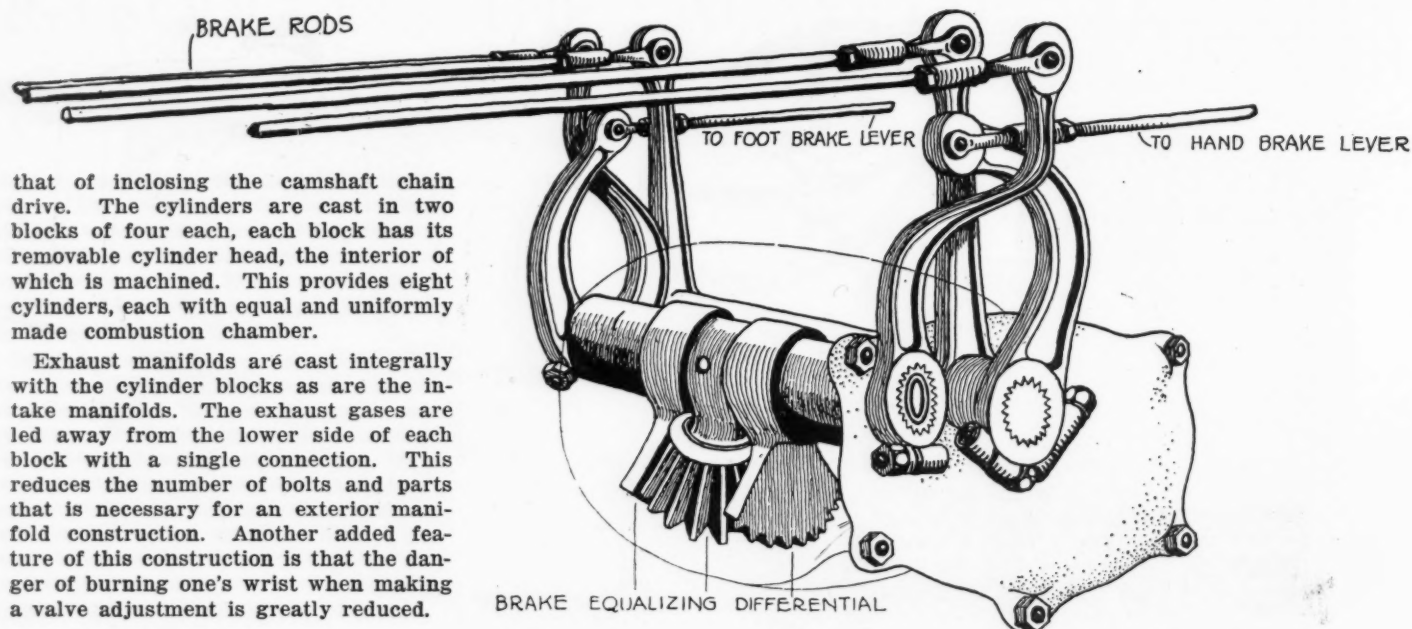
The engine construction is a unit with the clutch and transmission. These three units comprising the power plant assembly are set slightly at an angle and are connected to the floating rear axle through an unusually large torque tube which absorbs all of the driving and braking strains. When under load the power is transmitted in a straight line from the engine crankshaft to the pinion gear of the differential, this construction necessitates only one universal joint.

Four point suspension is employed for the engine. As laid out the LaFayette chassis construction facilitates getting at the front of the engine. The front cover plate performs only one function:



LaFayette chassis is low, with side-bars of deep section, rigidly braced. Wheelbase 132 inches. Small wheels and large cord tires, 33x5 in., a foreign influence in design. Chassis designed especially as proper foundation for enclosed bodies.





Pinion and sector equalizer of LaFayette design, assembled with transmission.

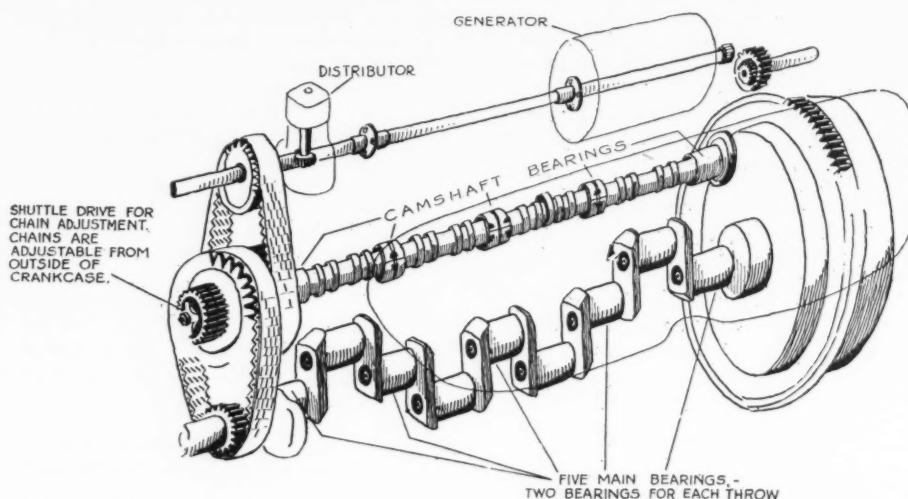
that of inclosing the camshaft chain drive. The cylinders are cast in two blocks of four each, each block has its removable cylinder head, the interior of which is machined. This provides eight cylinders, each with equal and uniformly made combustion chamber.

Exhaust manifolds are cast integrally with the cylinder blocks as are the intake manifolds. The exhaust gases are led away from the lower side of each block with a single connection. This reduces the number of bolts and parts that is necessary for an exterior manifold construction. Another added feature of this construction is that the danger of burning one's wrist when making a valve adjustment is greatly reduced.

### Crankcase in Two Parts

The crankcase is in two parts, each part cast separately. The crankcase serves as an oil reservoir. There are no sumps or splash troughs for the connecting rods to fit into, for the oil is distributed under pressure. The lubrication system, which is briefly alluded to here, is more fully described later in our story.

The crankshaft is of special construction and has five bearings. It is a hollow forging of chrome nickel steel, these bearings are  $2\frac{1}{4}$  in. in diameter. Because of the extremely high bearing velocity of this large shaft the oil is forced through in plentiful quantities which, in addition to the purpose of lubrication, serves as a cooling medium to prevent the bearings from becoming unduly heated. The forward end of the crankshaft bears mention, because oil pump and water pump are both a part of and therefore directly connected with the crankshaft. A forged steel flywheel is bolted and dowel pinned to a flange on the rear end of the crankshaft.



Crankshaft of Liberty motor type is hollow forging of chrome nickel steel. Five large main bearings hold it rigidly against whipping and make extremely high speeds possible.

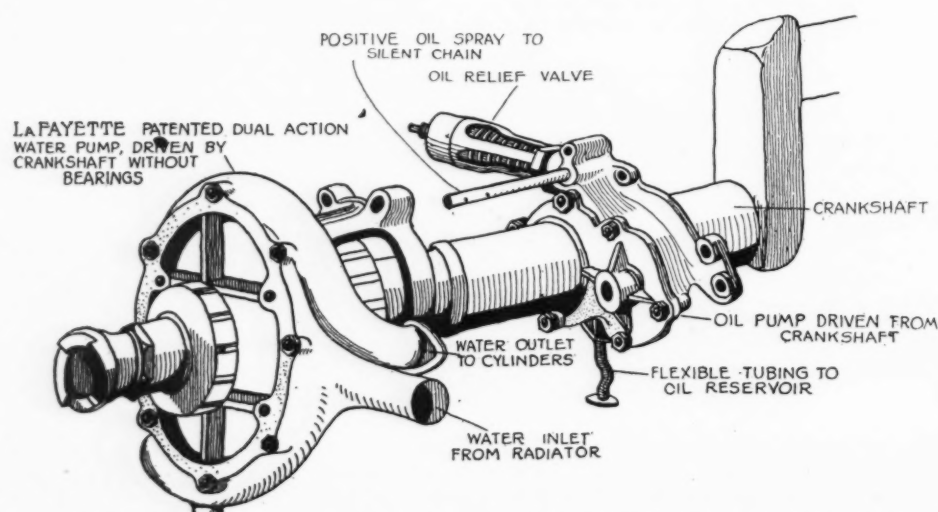
The sub of the flywheel is drilled for lightness.

All bearings are of bronze backed construction and the Babbitt metal is of special analysis similar to that used in refined aviation practice. The bearings are hand scraped and polished.

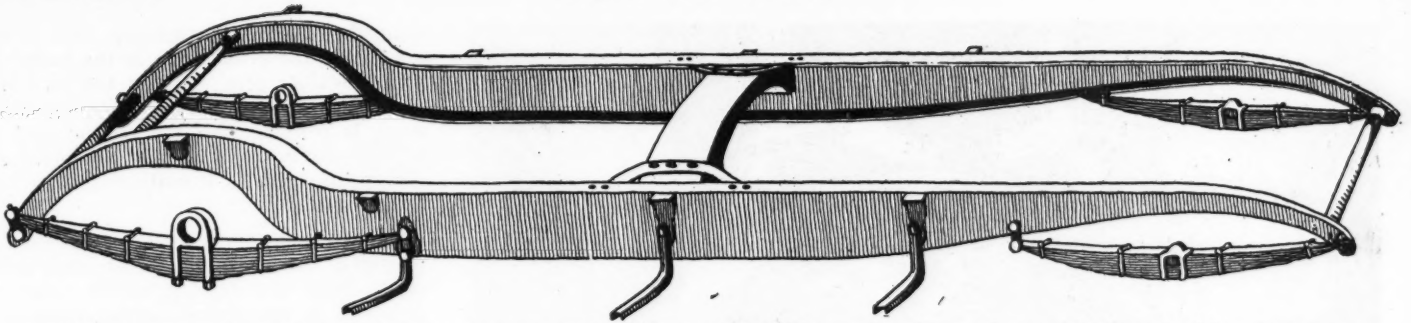
### Camshaft Also Is Hollow

On the forward end of the crankshaft is provided the drive for the camshaft. A silent chain is employed. The Morse patented adjustment on this chain makes it possible to take up wear from the outside of the crankcase. Lubrication of this chain is direct from an oil lead under pressure.

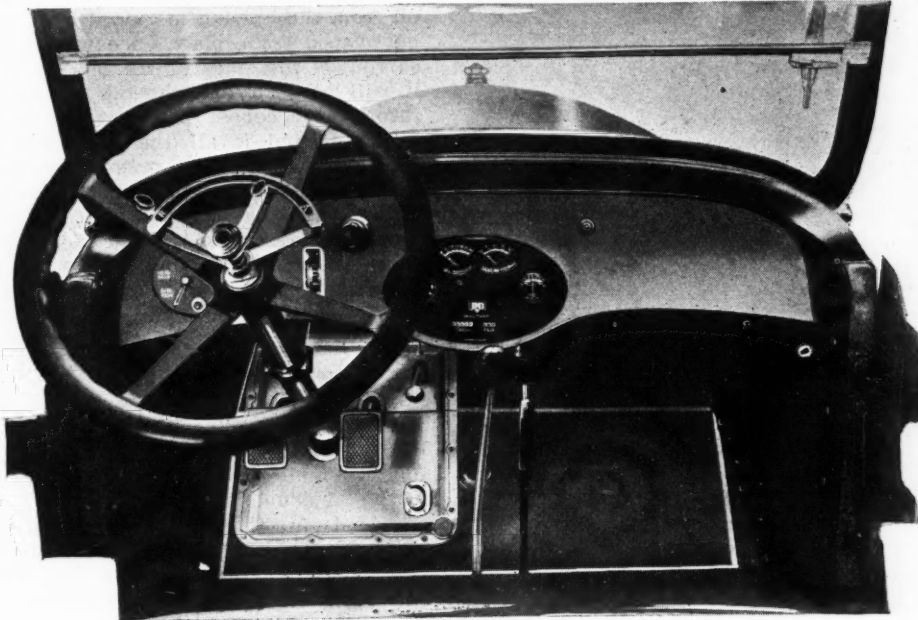
Like the crankshaft the camshaft is hollow, for the purpose of reducing weight and also to furnish more complete lubrication. There are five cast iron bearings on the shaft, the center



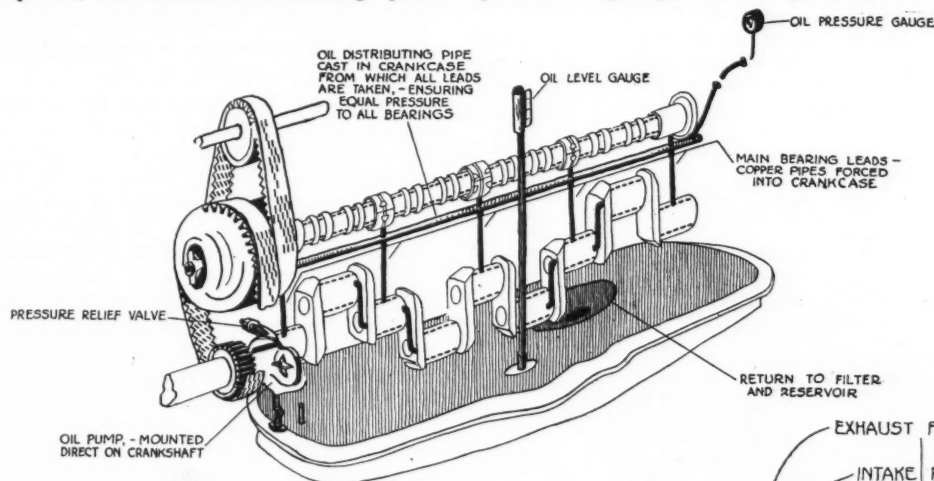
LaFayette patented dual action water pump and oil pump are both driven by the crankshaft.



The LaFayette frame is a channel section, six inches deep, stiffened by cross-tubes and central channel with gusset stays.



Driving compartment has many new features. Steering wheel with walnut rim and spokes; unit dash dial, indicating speed, trip, time, amperage, oil and gas pressure



Pressure circulation system by LaFayette patented oil pump, direct-driven on crankshaft. Crankshaft and camshaft bearings under oil pressure and front and chains in line of main supply of oil under pressure.

one and two intermediate bearings being of split construction. It will be noted that while this engine has but one camshaft on it there are sixteen cams. Each valve tappet is actuated directly from the cam to the roller tappet to the valve stem. This type of camshaft is a feature in the LaFayette engine. The construction gives a very large area for each tappet, which tends toward a reduction of wear. Another feature of this construction is that identical valve

action on both sides of the engine is secured, the valves open and close on either side with the same velocity.

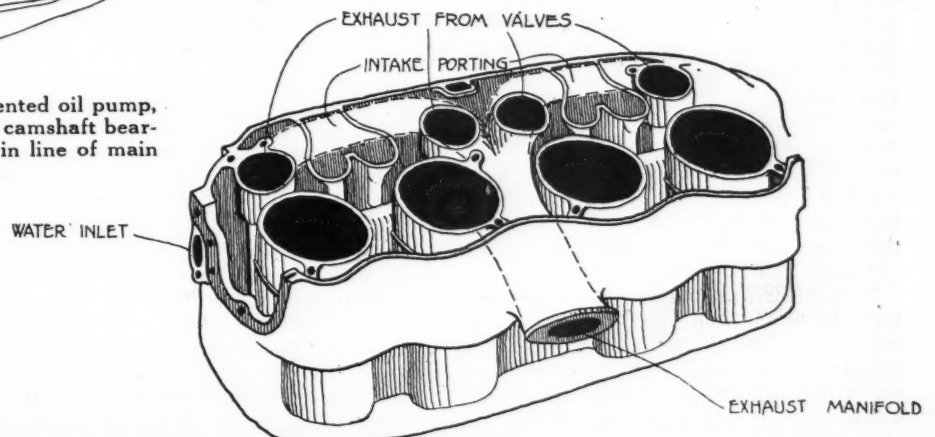
In order that the valves may be brought as close to the combustion chamber as possible the tappets and valves are set at an angle of 9 degs. with the cylinders. This produces an angle of 109 degs. in the valve alley, which provides a maximum of handroom and makes accessibility of the valves easier.

#### Tungsten Steel Valves

The valves are forged from tungsten steel, the heads and stems being integral.

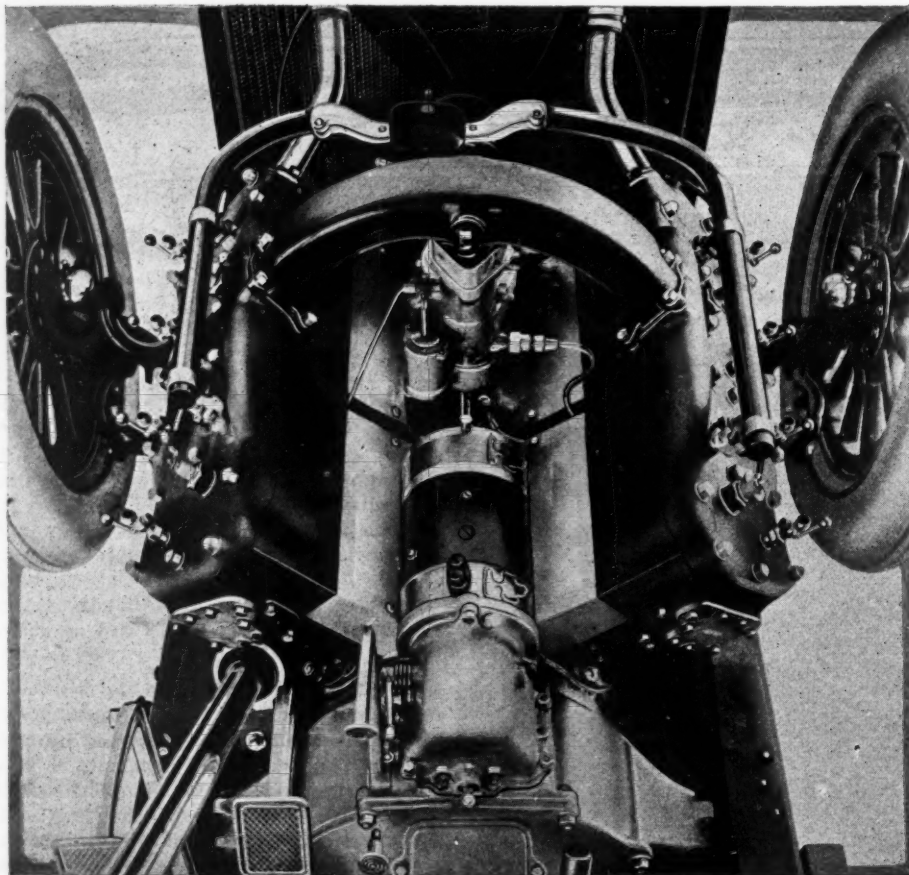
The connecting rod construction is of the forked type. The straight rod fits very closely on a bronze bushing. The angle of oscillation on the straight rod is 33 degs. and 44 min. To insure that the weight of the reciprocating parts will be the same for each cylinder the connecting rods are machined over their entire surface. Cast iron pistons are used. Very close grained iron is employed for the piston castings, which permits of a very light piston. Ribs, substantial in size provide the necessary strength in the head of the piston. The wrist pin is tubular, is case hardened and ground. It is secured in the piston and turns in the end of the connecting rod.

The cooling system in the LaFayette car, while not new in principle, has several features which are worthy of mention. A single pump of the dual type supplies water for each of the two blocks. The pump is on the forward end of the crankshaft and is of the centrifugal type. No gears or extra bearings are needed for this type of water pump



The water jackets, intake manifolds and exhaust manifolds are integral with the cylinder blocks.



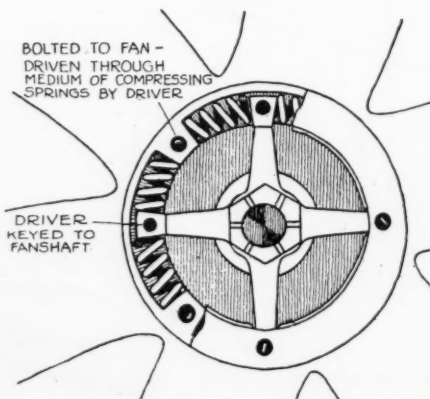


The intake and exhaust manifolds are integral with the blocks, leaving an unusually clean and unobstructed V. The motor-generator is of new LaFayette-Delco design, lies compactly in the angle between the blocks and the intake manifold, exhaust-heated, forms a graceful arched bridge.

construction. The regulation of the engine temperature is automatic and is maintained by vertical shutters in the radiator that are operated by vacuum and controlled thermostatically. A metal thermostat is located at the rear of the cylinder block. It functions as follows: When the engine is cold the shutters are closed and as the temperature of the cooling water increases the shutters open automatically. This construction overcomes the difficulty that heretofore has been inherent with a controlled water by pass. Generally with a water by pass, a dead quantity of water is left in the radiator which does not circulate, and which is apt to freeze before the thermostat allows it to circulate. Another interesting feature in connection with the cooling system is the method by which the fan is driven. As the illustration shows, there is no direct connection between the fan drive shaft and the blades of the fan; a spring being interposed at this point, which absorbs the jars and strains due to sudden changes in engine speed.

The oil pump, which is of the gear type, is located on the forward end of the crankshaft. The driving gear is keyed to the shaft. A housing containing this gear and idler gear forms the whole pump. The entire amount of oil in the reservoir is not in constant circulation as is usually the case. A pressure relief valve is provided which returns

the oil to the reservoir and which passes only the oil that is needed. It is contended by the LaFayette engineers that this system adds greater life to the oil.



A compensating spring-drive of LaFayette patent absorbs the shock due to changes in engine speed.

This pressure relief valve is adjustable and can be easily reached by removing a small hand hole plate in the crank case. Crankshaft and camshaft bearings are lubricated by oil under pressure. Both of these shafts are hollow and thus carry their own oil for lubrication. The throw-off and oil mist created by the revolving of the shafts serves to lubricate the pistons, cylinders and valves. There is only one extension

from the engine carrying oil. This is the lead from the crank case to the dash. A small flexible pipe conveys the oil from the reservoir to the pump. An oil level gage is provided on the engine and is high enough to be easily visible. At night this gage is illuminated from the engine lamp.

Special mention is made of the device provided for draining water and sediment from the oil. A small bowl is provided in the bottom of the reservoir, which is approximately six inches in diameter. Into this bowl the return oil from the bearing is guided by a funnel shaped baffle plate. A copper gauze surrounds the sides of the bowl. Thus it will be seen that the oil in passing through the copper gauze of this bowl, leaves behind it all the solid matter. This sediment can be removed without disturbing the contents of the oil reservoir. When the screw plug in the bottom of the reservoir is removed a check valve automatically closes, allowing the oil strainer pocket to be clean, but closing the passage so tightly that no oil can escape.

### Delco Electric System

The electric system is Delco through-out. Ignition is a LaFayette-Delco dual system. Spark advance is automatic. A double set of contact points is provided in the distributor housing, which adds greatly to the life of each. The ignition wires extend fanlike from the sides of the Bakelite cap, instead of protruding from the top. A motor generator serves for starting and lighting. The location is between the V and toward the rear. The storage battery is Exide, with extremely heavy plates. The voltage of the system is six.

The fuel system combines the LaFayette carburetor with a 20 gal. tank at the rear, from which the fuel is fed by air pressure. The air pump which creates this pressure is located in the center of the engine V and is driven from eccentric on the camshaft. The intake manifold forms an arched bridge between the cylinder blocks. It is elliptical in shape, the intake gases passing through the center of the casting and hot exhaust gases heat the inner walls and form extremely hot surfaces for the mixture to pass over. The carburetor is of the air-valve type and incorporated in it is a dashpot that supplies a rich mixture for acceleration. A unique thumb-wheel adjustment on the dashboard controls the auxiliary air valve.

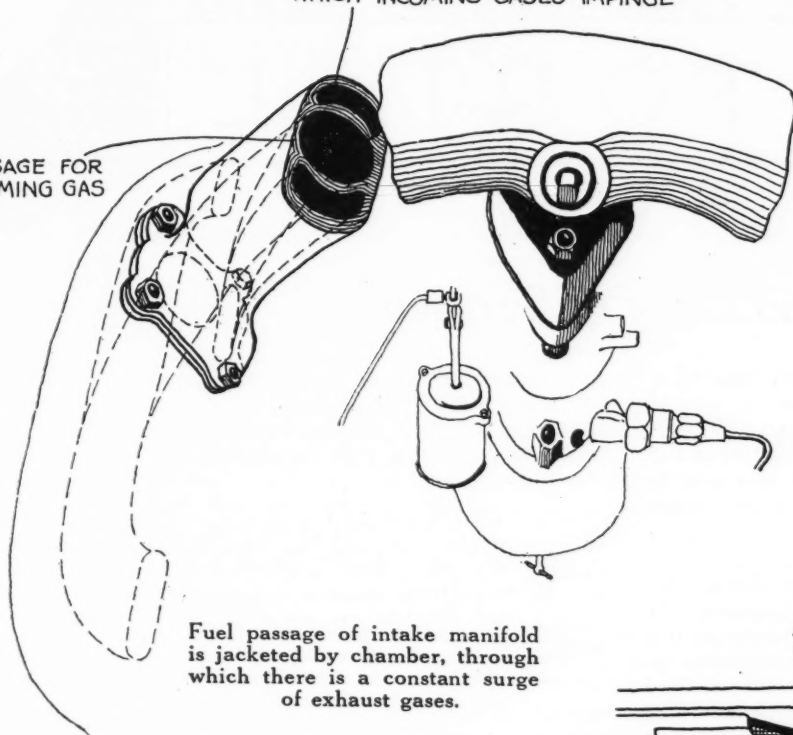
The clutch of the multiple-disk, dry-plate type. Seventeen steel plates driven by the flywheel and faced with compressed asbestos engage with sixteen steel plates secured to the clutch shaft. A special linkage provides a great reduction in the pressure necessary to declutch.

A three-speed selective transmission made by Brown and Lipe is in unit with the engine. The housing is of aluminum and an inspection plate at the top of the housing gives easy access to the parts.



PASSAGE FOR EXHAUST GASES, PRODUCING HEATED SURFACE ON WHICH INCOMING GASES IMPINGE

PASSAGE FOR INCOMING GAS



Fuel passage of intake manifold is jacketed by chamber, through which there is a constant surge of exhaust gases.

The rear axle is of LaFayette design, is of the floating type and because of its aluminum construction is light in weight. The live axle shafts are tubular for lightness and are made of an alloy. The final drive is through spiral bevel gears. The carrier for the differential pinion is aluminum. A bearing is provided on each side of the pinion gear, making possible a short shaft with the vibration consequently reduced. The front axle is a drop forging of the reversed Elliott type, in which the steering knuckles are yoked instead of the axle. The tie-rod located in back of the front axle.

#### Novel Brake Rod Assembly

Worthy of mention is the layout of the brake rod assembly. The rods are pivoted at a position that swings in unison with the large torque tube. This eliminates much of the brake rod chattering and squeaking produced by a sudden application of the brakes. It also provides a stationary foot brake pedal when covering extremely rough road. Equalization is affected through a differential gear similar to the construction of the rear axle. This differs from the usual whiffle-tree principle usually employed.

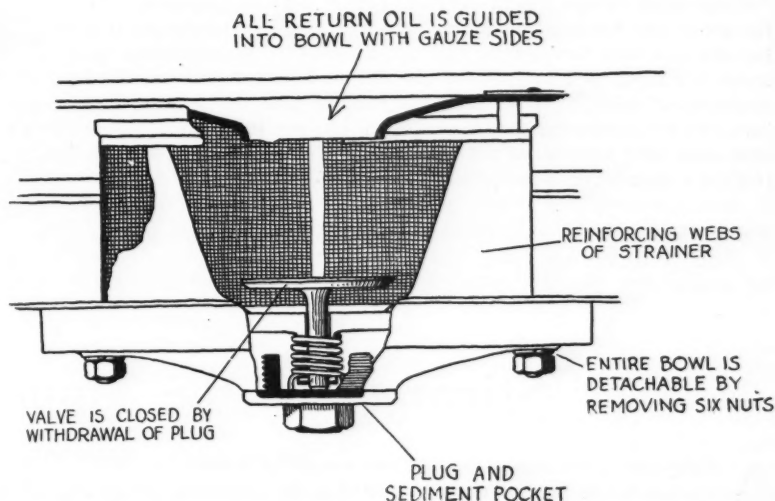
Steering is accomplished through a worm and sector gear adjustable with ball thrust bearings. A light aluminum housing incloses the gears. The steering wheel is 18 in. in diameter.

Semi-elliptic springs are used on both the front and rear. The front springs are 42 in. long,  $3\frac{1}{4}$  in. wide. The rear spring is 60 in. long and  $3\frac{1}{2}$  in. wide. This is an extremely long spring considering that it is of the semi-elliptic type.

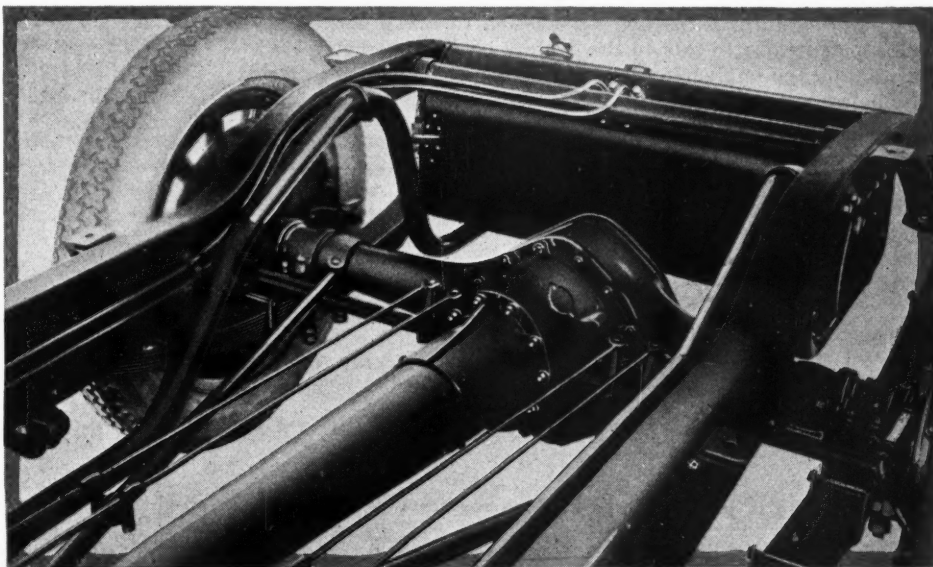
The dashboard is unique in its con-

struction, the instruments being covered by one plate glass. The background for the dial to all of the instruments is common. Any or all of the instruments may be removed from the rear of the dial.

Equipment on the car is very complete. Curtains that open with the doors are provided with stiffening rods to prevent sagging. The curtains are marked for position and have their individual compartment under the front seat for stowing purposes. Other interesting items of equipment are an engine service lamp which illuminates the engine and oil level indicator and is provided with an extension reel; a cigar lighter on the dash; tilting reflectors for headlights to deflect light and prevent glare, controlled by a convenient foot button. Small tool compartment in left front door provided with lock; wind shield cleaner, rear sight mirror, cowl ventilator and five parcel compartments in doors and rear quarters, all of which are universally keyed.



Return oil is guided into copper gauze bowl in center of reservoir. Sediment and water collected within bowl may be removed by screw plug. Check valve allows strainer pocket to be cleaned but closes passage so no oil can escape. Separate plug is provided for draining contents of reservoir. Patented by LaFayette.



Entire cycle of movements from transmission to rear axle is enclosed. Straight line drive from engine to axle, necessitating only one universal joint, lubricated from transmission. Drive of car is taken through rigid steel torque tube.



# EDITORIAL



## The Duty of Service

**A**TTENDANCE at the opening day's session of the New York Automobile show gave the lie to those pessimists who a few years ago were talking about the "saturation point" and more latterly spoke of motor car exhibitions as "things of the past." The attendance opening day in New York was greater than ever before, and the percentage of dealers in attendance was greater.

**U**NQUESTIONABLY the automotive industry faces the greatest future which ever lay before a great business. So far from any "saturation point," the big problem of the industry for the next few years will not be of getting a demand to meet a supply but supplying the demand which has already manifested itself. So far from supplying that demand in the last twelvemonth, makers have been unable to keep abreast of it and 1920 sees more persons in the United States demanding cars than even Jan. 1, 1919, witnessed.

**I**T is obviously the duty of dealers to help the makers in this demand which confronts them. And they can do that only by conserving insofar as possible, the supply which already

exists. And this means more careful and intelligent rendition of service. Only by keeping the cars now in operation in first class condition can the makers be given a breathing space in which to catch up with the existing demand for cars.

**S**O the service problem is a moral obligation with dealers everywhere. America has been too prone to scrap the old and buy the new. With production curtailed and even at its full far behind the demand, we must remake ourselves. We must get all possible use out of our old cars before we scrap them.

**W**E cannot do that unless proper service is given on cars now in use. The repair man and the service man should take as much pride in his finished product as the manufacturer. We must have an esprit de corps in the service shop as well as in the factory. And only by adopting advanced methods of operation can better service, more intelligent service, more lasting service be rendered. The shows this year, perhaps, as never before, show the necessity of good service.

## Stirring Up the Implement Dealer

**A** SIGNIFICANT indication of the trend of events in the tractor trade is that the Sales Managers' Division of the National Implement and Vehicle association has caused to be put on the program of all conventions of retail implement dealers this winter the topic: "Is the implement dealer measuring up to expectations as a seller of tractors and power farming equipment?" And the sales managers in addition send representatives of their association to every convention with instructions to talk to the dealers on this subject. They are telling the implement dealer in how many ways he is falling below expectations and they are telling him what he must do to get himself back into line.

**I**N justice to the retail implement dealer it must be admitted that he is at last waking up to the importance of the tractor trade and that to some extent he is bestirring himself to retain a hold on a trade which is slipping away from him. One may justly entertain a suspicion, however, that a good many of them are waking up too late. There is such a decided trend toward the motor car dealers in the tractor trade that it is almost certain he will dominate the business of selling tractors and power farm operative equipment in the future, no matter what the retail implement dealer may do. The wise implement dealer will take time by the forelock and become automotive.

DON'T FORGET

Motor Age will start its series of

STANDARD MECHANICAL OPERATIONS IN TRACTOR SERVICE

Showing in pictures steps in repairing tractors, which are kindred to the operations in repairing trucks and motor cars

BEGINNING IN THE FEBRUARY 5 ISSUE

# Lincoln Highway Issues Annual Report

## More Than \$9,000,000 Spent on Construction and Maintenance During Last Year

**D**ETROIT, Jan. 5—More than \$9,000,000 was expended for construction and maintenance work along the Lincoln Highway, according to the annual report of the Lincoln Highway Association, recently issued from headquarters here. Despite the fact that road building operations in the last year were to a considerable extent held up on account of shortage of materials, labor and the prevailing high cost of construction, 1919 marked a big step in the advance of the great transcontinental road. Even greater plans, however, have been made for 1920 and there is little doubt that the coming twelve months will see the greatest period of activity in the history of the association.

### Gets Federal Aid Assistance

The Lincoln Highway was at first largely a series of connecting country roads but has gradually become an official thoroughfare through the action of various states through which it passes. It has been made an integral part of the state highway systems in most of the commonwealths it traverses, with the result that it has benefited by the augmentation of state and county road funds by the Federal Aid appropriations. Eleven states have so adopted the road as an official highway and the route is being constructed and improved directly under the inspection of Government authorities for more than three-quarters of its length from New York to San Francisco.

In the following table, prepared by the Lincoln Highway Association, showing the expenditures on the Lincoln Highway in each state traversed, the amount of federal and state aid accurately reported through the state highway departments is augmented by such scattered county reports as were available. In nearly every state, however, the expenditures were larger than the actual detailed figures reported.

New Jersey, \$1,383,572.  
 Pennsylvania, \$1,418,169.28.  
 Ohio, \$1,903,708.10.  
 Indiana, \$742,218.30.  
 Illinois, \$1,430,120.28.  
 Iowa, \$256,899.29.  
 Nebraska, \$613,025.  
 Wyoming, \$127,009.94.  
 Utah, \$225,528.54.  
 Nevada, \$411,049.58.  
 California, \$375,500.  
 Total, \$8,886,800.31.

To the above must be added much of the county construction and maintenance work and city paving for which it is impossible to get accurate detailed figures. Conservative estimates resulting from actual inspection of such work in progress indicates that these unreported expenditures amounted to over \$500,000 in 1919.

To give significance to the meaning of the above figures as showing the tremendous impetus given Lincoln way improvement during the past year, the as-

sociation presents the following table indicating the amounts expended for Lincoln Highway construction and maintenance during each year since the association actively undertook its work.

Yearly expenditures on the Lincoln Highway:

1914, \$1,200,000.  
 1915, \$2,580,280.  
 1916, \$4,198,165.  
 War, 1917, \$2,500,918.96.  
 War, 1918, \$2,996,307.77.  
 1919, \$9,386,800.31.

Total expenditures on Lincoln way in six years, \$22,362,472.04.

It is interesting to note that the total amount spent for Lincoln Highway improvement by all of the states crossed by the road between the two coasts in 1914 was less than the amount spent on the work in four separate states during the past year. The association also points out that contracts covering a total of 159.8 miles of permanent improvements were let in 1919 in seven of the states traversed by the route, the total amount of these contracts aggregating an additional \$2,323,112.59—money already provided and in addition to that actually expended for work completed in 1919. It will thus be seen that total financing for Lincoln Highway improvement during the past year has amounted to close to \$12,000,000, only about a million short of the total actual expenditures for the five years 1913 through 1918.

### Permanent Improvement Accomplished

While construction costs are interesting as reflecting the increasing demand for proper permanent improvement and a correspondingly increased willingness to liberally provide the necessary money for the work, the tourist or traveler or those interested in highway freight transportation, will be more concerned with the constructive results accomplished through these expenditures. The Lincoln Highway Association points out as significant the increasing proportion of the total expenditures which are permanently invested in standard types of construction designed to meet the traffic of the future. In addition to the considerable cost of properly maintaining such a heavily traveled road as the Lincoln Highway, 377.33 miles of new permanent work was accomplished on the Lincoln Highway during 1919. This new mileage was of the following types:

Concrete, 121.14.  
 Brick, 21.28.  
 Bit. Macadam, 17.61.  
 Macadam, 28.75.  
 Gravel, 69.25.  
 Shale, 2.  
 Permanent earth grade, 117.3.  
 Total, 377.33.

The concrete and brick improvement put in on the Lincoln Highway during

the past year was largely in the eastern states and in California, where the tremendous traffic carried by the route and the vast sums available for highway construction combined to make the highest type of work necessary and possible. The nineteen miles of new Lincoln Highway completed in New Jersey were all of the highest type of concrete construction. This section of the Lincoln Highway between Philadelphia and New York carries not only the heaviest traffic of any section of the transcontinental road, but also what is said to be the heaviest traffic on any road in America. As an instance of this density of traffic, a careful census made on the Lincoln Highway bridge over the Passaic River west of Jersey City last spring by county officials showed the passage of 11,000 vehicles in a period of fifteen hours. Small wonder that the old macadam which constituted the Lincoln Highway in New Jersey went rapidly to pieces. The Pennsylvania section of the Lincoln Highway comprising the main traveled road between Pittsburgh and Philadelphia and other eastern points carries a traffic volume almost as heavy as the New Jersey section.

This famous route through the wonderful scenery of the Alleghenies, constructed for years of the highest grade of macadam was largely torn to pieces by the tremendous volume of motor truck traffic it carried during the war, when it was used as a Government transport route. The excessive cost of yearly maintenance work has caused the Pennsylvania State Highway Department to undertake the gradual reconstruction of the entire road of concrete and over 19 miles were completed in 1919.

Ohio took a long step towards the permanent completion of the Lincoln Way in 1919 by completing 56½ miles of new concrete, brick and bituminous macadam. Indiana completed twenty-one miles of new concrete, and Illinois thirty-five. The few remaining gaps of unimprovement on the Lincoln Way in these states will be taken care of during 1920, with a result that the end of the year will see a completed permanent all-weather road from Times Square to the Mississippi River, providing the shortest, best and most direct route between New York and Chicago.

### Western Progress

West of the Mississippi progress toward the ultimate achievement of the Lincoln Highway ideal has been if anything more notable than that accomplished in the East, for the reason that during the past year fundamental diffi-

(Continued on page 25)



## Show at Rochester to be Best Ever Held There

ROCHESTER, Jan. 4—An array of automobiles and trucks, such as never before have been assembled at one time in Rochester, will greet the public here the week of Feb. 2-7 inclusive, when the Twelfth Annual Automobile Show will be staged by the Rochester Auto Trades Association. Every bit of available space for passenger car, truck and accessory has been sold for a month past. In fact the demand for space was so acute that automobile dealers who failed to get space organized an association of their own and held a show.

In announcing the fact, that every bit of available space had been sold, Eugene J. Ellis, president of the Auto Trades organization, announced the following list of passenger cars which will be on display during the week of the show. It is as follows:

Buick, Chevrolet, Cadillac, Cunningham, Chandler, Cleveland, Dodge, Dort, Detroit Electric, Elcar, Essex, Ford, Franklin, Grant, Hupmobile, Haynes, Hudson, Jordan, Lexington, Milburn Electric, Marmon, Nash, Oakland, Oldsmobile, Overland, Paige, Packard, Peerless, Pierce-Arrow, Rausch & Lang Electric, Reo, Saxon, Studebaker, Stearns-Knight, Scripps-Booth, Standard Eight, Velie, Westcott, and Stutz.

The list of passenger cars is the most complete and comprehensive that has ever been on display in a Rochester show. It contains a car to will the needs, the requirements and the purse

of every man who intends or can afford to buy a machine. It contains ideal cars for salesmen, for tourist, for town use, and for country work.

But passenger cars alone do not make up the automobile show. There will also be trucks and accessories. The following is the list of trucks: Atterbury, Commerce, Dodge, Duplex, Federal, Ford, F.W.D., Krebs, Maccar Mack, Nash, Nash-Quad, Packard, Pierce-Arrow, Oldsmobile, Reo, Shelden, Sullivan and White.

### PHILADELPHIA SHOW LARGER THAN LAST YEAR

Philadelphia, Jan. 2—Complete figures for the nineteenth annual passenger automobile show, to be held Jan. 10 to 17, in the Commercial Museum, under the auspices of the Philadelphia Automobile Trade Association, show that there will be displayed on this occasion the largest number of makes of cars ever exhibited at a similar show in this city. The total is 71 makes of cars as against 57 shown last year. Several new makes will be shown.

Some concerns handle three or more makes of cars.

There will be twenty-two accessories exhibitors, a smaller number than usual, owing to increased demand for passenger car space.

Forty-one exhibitors for the motor truck show, which will be held in the Commercial Museum the week following the passenger car show, applied for space representing fifty-one makes of trucks, tractors and trailers, there being

few of the latter two types of vehicles, however. A few accessory exhibits will be at the truck show.

Following a request from Chairman Louis C. Block, of the show committee, truck owners represented in the exhibit will display on their vehicles on the streets, signs advertising the show for two weeks prior thereto.

### RAISE SHOW ADMISSIONS

New York, Jan. 4—The price of admission at the New York and Chicago Automobile Shows will be 75 cents this year, instead of 50 cents. This is due to the higher cost of staging the exposition. Shows generally are costing this year from 30 to 50 per cent more than in previous years. Following the action of the N. A. C. C. in raising its price, it is likely that quite a number of the larger shows throughout the country will do the same thing in accordance with sentiment expressed at a recent meeting of the National Association of Automobile Show Managers.

### ISSUE RULES ON DENATURED ALCOHOL

Chicago, Jan. 6—All wholesale dealers in denatured alcohol including automobile dealers who sell it for anti-freeze mixtures, are required to obtain permits for such sales from their district internal revenue collector according to a ruling given the National Automobile Dealers' association by the Treasury Department. No license, bond, registration or the like, however, is required of dealers who sell in lots of 10 gal. or less, the sole requirement being that such dealers purchase the alcohol in containers which are labelled in accordance with Treasury Department regulations.

### WICHITA SETS SHOW DATES

Wichita, Kan., Jan. 4—The Wichita Motor Trade Association, with a membership of more than forty dealers and accessory houses, has chosen the week of Feb. 23 for its annual Automobile Show. Arrangements have been made with Henry B. Marks for the management of this show. Leases have been taken on the Forum and Exposition Hall with a total floor space of more than 100,000 square feet.

It is expected that the Wichita Show will rank with the largest local shows in the country, most of the dealers having been promised the active co-operation of their factories.

### NIAGARA FALLS PLANS SHOW

Buffalo, Jan. 2—Niagara Falls, N. Y., is planning its first automobile show for the early spring. Alva F. Gluck, secretary of the Falls Automobile Club, is in charge of the campaign for a motor show, and is being given much encouragement by automobile and accessory dealers. It is proposed to hold the show in the Cataract Hotel building.

## "Ace Night" Planned at Chicago Aeronautical Show

CHICAGO, Jan. 3—The west's first tribute to the airmen who dared their all to clear the sky of the Boche, will be paid when the Aeronautical Show opens at the Coliseum in Chicago, Jan. 8. On "Ace Night," the second night of the show, the airmen and aircraft manufacturers will pause for a brief tribute to those whose heroism "up there" made possible victory, and to those other heroes whose daring advanced the science of aeronautics.

Next week the Coliseum's great interior is to become the arena of the air. A star studded night sky with side panels depicting aircraft exploring all the historic mountain ranges and valleys in the world will furnish the idea of "The Top of the World."

Capt. Eddie Rickenbacker's bullet pierced "Spad," the army radio telephone equipment for complete demonstrations, every type of battleplane and

naval plane will be in the government display with the supplement of aerial war material such as bombs, torpedoes, flares and guns.

But the manufacturers promise attractions that will rival the showing of the air mail and other government features. Tiny and large dirigibles, huge luxurious limousine planes and the fast scout will be rivals for the attention of the airmen.

In the accessory section all the modern safety devices will be explained such as the parachutes, and all the intricate instruments required for navigation of the air, will be shown.

### BIG DEALERS COMBINE INTERESTS

Chicago, Jan. 6—A combination of interests between two of Chicago's largest dealers which has just taken effect may indicate a possible tendency among the automotive dis-

tributors to join forces in order to increase their field of activity without increasing proportionately the overhead expense. Real estate values have reached such a high point in Chicago that the operation of a number of retail stores and service stations in different parts of the city has to be curtailed even though the merchandizing considerations demand it. Also the same considerations prevent the expansion of service facilities.

It is probably for this reason that the Louis Geyler Co., distributor of the Dort in the northern part of Illinois, former distributor of the Hudson and Essex, has combined with Thomas Hay, distributor of the Chandler and Cleveland. By the new arrangement the Geyler company becomes the dealer for the Chandler and Cleveland in Cook County and also in the territory tributary to Peoria, where the Geyler company has a strong branch. Mr. Hay still will distribute the Chandler and Cleveland from both of the Michigan avenue houses and Geyler will distribute those cars as well as the Dort from his Peoria house as well as his large establishment on the north side, retaining the Michigan avenue building for distribution of the Dort and servicing of all three cars.

#### WILL MAKE BATTERIES

Worcester, Mass., Jan. 3—The Ionite Storage Battery Co. has been formed here to manufacture storage batteries. A plant has been fitted up at 180 Austin street. H. W. Burnham, formerly with the Howard Motor Car Co., has organized the new company. Other well known Worcester business men are interested in the company, which has a new process of making batteries. It has placed agencies in a number of cities in New England.

## Plan for Airplane Park in Boston Defeated By Voters

BOSTON, Jan. 2—Plans to make Boston a connecting link in the aerial mail service got a jolt when the city and Federal officials came out with a statement that the ideal place for landing would be at the Strandway at City Point and the residents of that district got up a mass meeting of protest. Army officials after looking over the city said there was no other place available, and pointed out all its advantages, and how letters could save hours going to New York and the West, and also could be dropped on outgoing liners from New York to Europe when off the Massachusetts coast hours after the mails closed at New York.

But the South Boston people argue that the Strandway was built to give the people a breathing space. And thousands of people from all sections of the city come there in summer to get the fresh air, particularly mothers with their families of youngsters who need the ocean breezes

## Service Managers' Bureau Plan of N. A. D. A. This Year

ST. LOUIS, Jan. 2—A service managers' bureau will be one of the new 1920 features of the National Automobile Dealers' Association if recommendations of the executive committee adopted at Cleveland, Dec. 6, are approved by the officers and directors of the association.

The service managers' problems are growing ones. Virtually the entire automobile industry now realizes that the abuses of the garage and service station must be corrected and the dealer must take the lead in this reform because the dealer is the interested party so far as contact with the owner is concerned.

Recently two service managers' associations were organized in the east. One is in New York and the other Newark. Immediately upon organizing the service men realized that their point was co-operation with the dealers and that individually their work could not be brought to its greatest efficiency. Conferences with service men throughout the country convinced the dealers' association that the logical outcome for this further organization was the establishing in the dealer organization of service managers' bureau which would take up these problems directly with both dealers and manufacturers.

If the plan is adopted a service manager will be appointed by Harry G. Moock, business manager of the dealers' association whose business it will be to organize service managers throughout the country and bring their organizations into the N. A. D. A. as local bureaus. The manager of the N. A. D. A. department will be a high class service

man, capable of devising costs plans, ratings, and the various other details of service station arrangement that now confront the service departments.

In connection with development of factory service and the relation of the dealer to the manufacturer, Moock announces that as a result of a conference with Alfred Reeves, general manager of the National Automobile Chamber of Commerce, the future meetings of the Service Managers' Bureau of the N. A. C. C. will be open to members of the National Automobile Dealers' Association who may desire to attend. Moock was a guest at the last meeting of the factory service managers' association at Detroit and as a result of the discussions taken up there he is convinced that great benefit can accrue to the dealers by participating in these discussions.

the first big step of the Ford organization in the European invasion, though branches already have been established in several countries. The company for some time has maintained branches in Paris and Bordeaux and recently established similar branches in Copenhagen, and in Cadiz, Spain.

Klingensmith, with Charles E. Sorensen, general manager of the Ford tractor plant, and others of the Ford organization, returned to Europe at the time of the departure of W. C. Anderson, Ford's British representative, who came to Detroit to confer with Ford regarding the controversy with British distributors and dealers. At the time of their departure for Europe it was said Klingensmith's mission would be to look over the European field and assist in the selection of distributors and dealers. Incidentally, it was said, he probably would investigate the feasibility of the establishment of branch factories.

Ford officials have received no word from Klingensmith as to just what steps he has taken, but from information at hand they are confident he has completed all arrangements for the establishment of the factory and will announce the details as soon as he has conferred with Henry Ford and other officials.

#### ROAD MAINTENANCE GOES UP IN NEW YORK

Buffalo, Jan. 3—Cost of maintaining New York state's roads has increased in three years from \$4,000,000 to \$15,000,000 annually, it is estimated by the state highway department. Efforts are being made by state automobile clubs and city officials to have permanent funds provided for upkeep before the proceeds of a \$100,000,000 bond issue set aside for this purpose several years ago are exhausted.

#### FORD TO INVADE EUROPE

Detroit, Jan. 3—Invasion of Europe and Asia by the Ford Motor Co., and plans for the establishment of European factories will be announced upon the return of Vice-President F. L. Klingensmith from Europe this week. A large plant in France, operated by American system, but with French labor, will be



## First Hoosier Entry In

Cliff Durant Draws No. 1 for Indianapolis Speedway Grind

Winner at Santa Monica Believes Number Carries Him Luck

INDIANAPOLIS, Jan. 3—Cliff Durant, millionaire son of W. C. Durant, head of the General Motors Co., registered the first entry for the eighth international 500-mile Sweepstakes race on the Indianapolis Motor Speedway Monday, May 31st.

Durant wired his entry from California, where, in the Chevrolet factory at Oakland, a special 183-cubic inch flier is being built to the new specifications of the Hoosier contest. Durant was also the first to enter the race last year, showing a decided partiality for the coveted No. 1 position on the entry list. Like all knights of the wheel, Durant has his pet superstition, his particular brand being that No. 1 carries luck for him.

Durant is the direct descendant of a generation of millionaire racing enthusiasts that formerly boasted such illustrious names as Caleb Bragg, Art Greiner, the later David Bruce-Brown and Spencer Wishart. He loves to drive racing cars, not for the financial reward, but for the thrill and glory of a victory well won. A millionaire in his own right many times over, by virtue of his holdings in the Chevrolet Motor Car Co. of California, of which he is vice-president, he risks the dangers of the speed sport and jeopardizes his millions for the sake of the intense stimulus of high speed competition.

Durant has figured prominently in the gasoline scented sport for several years, bearing the title of Pacific Coast champion by virtue of his victories in the 1918 Montamarathon and Potlatch contests at Tacoma, and his sweeping triumph in the 1919 Santa Monica road race, which he won at the highest speed ever recorded for that event, 81.28 m.p.h.

In all his speed encounters, Durant has been characterized by an absolute fearlessness and a display of reckless daring that borders on the verge of foolhardiness. From the time the starter's bomb explodes, his foot is heavy on the throttle, with no let-up until he either wins or his iron steed goes to pieces under the strain.

### FRENCH PLAN RELIABILITY RUN

Paris, Dec. 13—A 2600-mile reliability test for stock cars will be run round France from March 1 to 24. In this competition reliability only will be considered, speed not being taken into account at all. Stock machines at 183 cubic inches cylinder capacity must be used, with complete equipment and having at least two seats. Such essential organs as cylinders, gearboxes, rear

axles and wheels will be stamped and cannot be changed during the run. Otherwise drivers and mechanics are free to do any work they like on the cars, providing they finish within the time limits.

Generally the stages will not be more than 125 miles per day, so as to allow the cars to finish early in the afternoon and to give dealers and the public an opportunity of examining them. There will be an exception for the first stage, which is from Paris to Metz, a distance of 200 miles. Among the big towns to be passed are Strasburg, Dijon, Lyons, Nice, Marseilles, Toulouse, Pau, Bordeaux, Tours, Nantes, Le Mans, Rouen, Boulogne and Paris. Both factory and private entries will be received, the former being limited to three cars of the same make.

### PERIL FRENCH GRAND PRIX

Paris, Dec. 13—Forty-seven French automobile manufacturers having signed an agreement not to race next year, the Automobile Club of France has given official intimation that there will be no Grand Prix in 1920. It intimates, however, that there will be one or more important speed contests in 1921. The French manufacturers who are quoted as representing the opinion of the majority in France comprise twenty-seven who have never taken part in a speed contest of any kind anywhere. Five of them are truck manufacturers who never have built a touring car. Of the remaining twenty there are five which raced years ago, but which for the last ten years have been bitter opponents of all speed contests, and indeed of competitions of all kinds. Two others have never built anything but miniature cars.

Despite this official decision of the French makers, racing cars are being built, and will be entered in contests abroad. One of the firms having signed against racing has a set of 183-cubic inch racing machines in a very advanced condition. These will be sent to Indianapolis and probably will be run later in the year in the Italian road races.

### MURRAY CO. PLANS PRODUCTION

New York, Jan. 2—Production of 1500 cars in the first year for which orders have been received, is planned by the Murray Motor Car Co. of Newark, N. J. The factory equipment has been moved from Pittsburgh to the new plant now being erected on the 4½ acre plot on Frelinghuysen avenue and the Pennsylvania railroad in Newark.

Only a few minor changes will be made in the Murray for 1920, according to E. H. Worne, general manager. A Murray service station is being maintained at Forty-seventh street and Eleventh avenue, New York, in charge of George O'Bierne.

The personnel of the company consists of: Hon. Patrick J. Dolan of Newark, president; William P. Cubberley, Reeves-Cubberley Engine Co., vice president; Harry Green, secretary and general counsel; Nat Levy, treasurer; Edward Blau, Newark, director.

## Italy Plans Two Races

Targa Florio and Florio Cup Events Scheduled for May 5

French Racing Cars Are Expected to Swell Field for Mountain Classic

PARIS, Dec. 6—Two races will be held in Sicily next spring. One will be for the Targa Florio, and the other for the Florio Cup. The probable date of these races,—for the two will doubtless be held on the same day,—is May 2.

The Florio Cup will be competed for by 183 cu. in. racing cars, which will have to cover five laps, representing 335 miles of the most difficult mountainous course. The Targa Florio will be for stock-cars entered by either manufacturers or owners. These cars will be divided into classes according to their cylindrical area. Four laps of the same course will have to be covered, the distance being 268 miles.

The Sicilian races date back to 1905, and have always brought together the best drivers to be found in Europe. The course selected is admittedly one of the most difficult in the world. Only the best drivers can hope to win under such conditions, and any car which stands up at speed on this Sicilian course is undoubtedly a well built machine.

Details on the races have not yet been prepared.

### THIRTY ENTER FOR TRUCK RUN

Milwaukee, Wis., Jan. 5—Thirty motor trucks have already been entered in the big mid-winter demonstration tour to be conducted by the motor truck division of the Milwaukee Automobile Dealers, Inc., as a corollary of the twelfth annual Milwaukee show, Jan. 19 to 25, in the Auditorium.

The tour will cover about 300 miles and consume three days, ending at the Auditorium about the time the show is formerly opened on Jan. 19. The first day, Jan. 17, the route will be from Milwaukee to Sheboygan, with Port Washington as the noon control. On the second day the caravan will travel from Sheboygan to Fond du Lac, with Plymouth as the noon stop. On the third day the route will be from Fond du Lac to Milwaukee, with West Bend as the main stop. It is expected that the finish will be in time to place the participating trades on display in the truck show, in Machinery hall, for the inspection of the first night crowds.

### ESSEX MAKES FAST RUN

Boston, Jan. 5—From Boston to the Canadian border and return, a distance of 1013 miles in 32 hours with the thermometer flirting with zero is the record just hung up here by an Essex car. Nine drivers handled the car in relays, and newspaper men acted as observers. The temperature ranged from 5 above to 20 below during the run, and Fred E. Peterson, who drove the relay to the Canadian



line, froze one hand, while C. R. Hall on the Bangor relay froze three fingers.

The car left Boston Monday night, and whirled along through Massachusetts to Portsmouth, across New Hampshire and into Maine. The roads were slippery with snow, while patches of ice loomed up here and there, and there were many ruts frozen hard five and six inches deep. From Bangor North the highways got steadily worse and the cold became bitter.

The drivers kept the car going up through the potato country of Presque Isle and then on to Ft. Kent, reaching there Tuesday afternoon. That was the turning point. Back they came over the same route through snowdrifts piled up by the wind. At Portland the four chains were removed and despite the fact that there was some snow on the ground the car was driven on some stretches from 65 to 70 miles an hour. The bleak cold from the Atlantic Ocean on the return lap made the occupants shiver, for it was an open car, but there was no stopping for weather and into Boston they whirled early Wednesday morning, tired, cold, hungry, but happy.

#### MERCER TO HEAD NEEDHAM TIRES

New York, Jan. 3—Lieut. Col. A. L. Mercer, for several months Assistant Director of Sales of the War Department, resigned Jan. 1 to become president of the Needham Tire Co., Charles River, Mass. It is reported that the Board of Directors will elect Mercer president at the January meeting.

Coincident with this report comes the announcement that the Needham company will expand its tire business to include a full line of rubber goods for automotive uses.

Mercer entered the service in September, 1917, as an Ordnance Officer and was stationed at the Remington Arms plant in Hoboken. Several promotions followed which led to his appointment, July 1, 1919, as Assistant Director of Sales. Before his military service Mercer was associated with the B. F. Goodrich Rubber Co. He will be succeeded as Assistant Director of Sales by Major H. S. Johnson, a special representative of Director of Sales E. C. Morse.

#### TRUCK FIRM TO HANDLE OWN SERVICE

St. Louis, Jan. 6—An innovation in truck distribution inaugurated by the Traffic Motor Truck Corp. in St. Louis is to be extended to other cities. The plan closely follows the distribution of passenger cars as practiced by the Ford Motor Co., in that a group of dealers are appointed in each big city, but is different in that service stations will be maintained by the Traffic Corp., leaving the dealer free to give his entire time and attention to the sale of trucks.

Nine dealers have been appointed to cover St. Louis, St. Louis county adjoining and East St. Louis, across the Mississippi. Service for trucks bought through the dealers will be handled at the factory in St. Louis.

## France Has Tire Shortage

### Profiteers Take Advantage of Situation to Boost Prices

#### Graft Charge Hits Official of One of Leading Manufacturing Firms

PARIS, Dec. 6—A serious tire famine prevails in France, and is rendered more acute by illegal profiteering and wild speculation. War contracts have only recently been cleaned up, but tire manufacturers are far from being able to meet requirements. It is estimated that the shortage will continue for the whole of next year.

Motor traffic has increased enormously since the war, and all cars which were laid away during hostilities have had to be fitted with new tires to replace those perished by age. Although tire quality is higher than ever, tire mileage is low, by reason of bad road surfaces. Not only has all civilian France been starved for five years, but all surrounding countries have been deprived of tires and are now ready purchasers, almost irrespective of price.

Profiteers have taken advantage of this situation and when able to secure tires have shipped them into Germany where they are sold at an increase of 40 to 100 per cent above list prices. This business is so profitable that those taking part in it send automobiles loaded with tires specially from Paris to Germany, a distance of 600 miles for the round trip.

Recently the police have taken action and have rounded up an important gang of tire profiteers. Among these persons is the general manager of a big French tire company, who supplied tires to his associates, to the detriment of other clients, and then shared with them the high profits obtained on the transaction. There are charges against this gang of receiving stolen army stocks and of getting tires by means of priority certificates to which they were not entitled.

#### DUNLOP TIRES COME HERE

Buffalo, Jan. 3—Negotiations for the coming to Buffalo of Dunlop America, Inc., were completed this week.

Approximately 100 acres of land have been purchased by the British Dunlop interests in the lower River road section of Buffalo, adjoining the Niagara river, thus providing opportunity for the company to ship by three methods, by lake traffic, the Erie canal and by railroad. The largest lake steamers can reach the docks which will be built in connection with the mammoth plant which the company will soon begin to erect. The Erie canal adjoins one side of the property and railroad sidings also cross it.

It is said by the company that an expenditure of approximately \$10,000,000

will be necessary before a wheel turns in the new tire manufacturing plant. Shops which will give initial employment to 5000 men will be built by the Dunlop Tire and Rubber Company of England. It is said 5000 men is but a fraction of the number of men the company has plans to employ if American business comes up to its expectations.

A permit authorizing temporary diversion of water from the Niagara river for use of the plant has been obtained by the Chamber of Commerce of Buffalo, also, to erect bridges crossing the Erie canal. Buffalo city trolley lines will be extended to the plant site, which is but two miles from the city limits.

#### FIAT FOLLOWS AMERICAN TRACTOR THEORY

Paris, Dec. 13—Fiat has put on the market a plow which, while capable of being used for all purposes, is specially designed for service behind the Fiat agricultural tractor. It is a 3-blade self-lift plow, built entirely of steel forgings and castings, and capable of being converted to 2-blades. The plow is carried on three wheels, two being at the front, with a diameter of 26 in., and the rear one being a spring-mounted castor type of 17½ in. diameter. The castor wheel keeps the plow in a straight line when plowing, and also enables turns to be made with ease. The two front wheels are spring mounted, this elasticity being advantageous for the general life of the machine and at the same time enabling the plow to ride over obstructions on the ground.

All the weight is on the front wheels when the plow is at work. There are three controls: one lever, which is operated by means of a cord from the driver's seat, raises or lowers the entire plow, and two others regulate the position of the front wheels in order to determine the depth of plowing and the evenness of the furrow. Total weight of the plow, with drawbar, 1120 lbs. Its wheelbase is 80 in., and total length, without drawbar, is 115 in. This is the first plow to be built in a European automobile factory.

#### CARLISLE TIRE TO BUILD BIG FACTORY

New York, Jan. 2—The Carlisle Tire Corp., recently incorporated in Delaware with \$3,000,000 capital, has purchased recently a 10-acre factory site in Stamford, Conn., on which a large plant will be erected. Floor space at Andover, Mass., has been leased for the production of tires until the new plant is ready.

The officers of the new corporation include: Joseph M. Gilbert, President; C. V. McGuire, vice-president; F. R. Serles, secretary; Frank Williams, treasurer; J. S. Bretz, chairman of the board of directors. Directors: C. V. Tuthill, W. R. B. Whittier, N. E. Parish, Charles Glover and J. S. McClurg.

# What a Dealer Thinks of "Free Service"

## Factory Should Bear Expense of Repairs Due to Faulty Design, He Says

BY R. S. MONTTOOTH  
(Parke Auto Co., Rushville, Ill.)

In the Oct. 27 issue of *Motor Age* an article written by Mr. J. B. Bray, Service Manager, Grant Motor Car Corp., was published on the subject of free service. Speaking with considerable experience as to the service rendered by the dealer and factory service organizations, let me say that if Mr. Bray's ideas were adopted it would create a condition very unjust to the dealer and owner.

### Owner Must Be Satisfied

For several years I have had charge of a dealer's service and repair department and have been successfully rendering service on several well known makes of automobiles. While I have found but few cases of faulty design, in the different makes of automobiles that have come under my observation, I have in mind some very flagrant cases of proven faulty design, expensive alterations, advised by the manufacturer (the major portion of the expense of which was borne by the dealer) has failed to correct.

There is no question but that the satisfied owner is the best advertisement for both the manufacturer and the dealer, but the owner is entitled to and should receive satisfaction. He has paid for automobile satisfaction that he has a right to expect from the advertised claims made by the manufacturer and representations made by the dealer. If he fails to receive this satisfaction it is the fault of either the manufacturer because of faulty design, or defective material or workmanship; or the dealer because of improper adjustments or inspection before delivery; or the owner because of misuse of abuse.

If it is the fault of the manufacturer, he should pay; not only for the defective or improperly designed parts, but for the labor necessary to install these parts. If it is the fault of the distributor or dealer he should pay not only for the labor but for the parts that were necessary to install, due to improper adjustments or lack of instructions to the purchaser regarding the use of his car.

### Maker Should Pay for Own Errors

In cases where the fault lies with the owner, he can usually be readily shown where it is his fault that his car has failed to give him the satisfaction he is entitled to and expects to pay. In the few cases where he refuses to admit that the fault lies with him in the face of facts, he can be made to pay without injury to the manufacturer, the distributor or the dealer.

There is no justice in the owner, dealer or distributor being required to suffer for the mistakes of the manufac-

turer or vice versa. The honorable and reliable dealer has a right to and evidently does presume that the truck or automobile that he contracts to recommend and sell to his friends and acquaintances has been thoroughly tested before it is placed on the market. It is not to be presumed that the automobile industry is in its infancy; but that there are principles and forms of mechanical construction which have been tested and found good and that any departure from these principles would necessitate an extremely exhaustive test before being adopted by the manufacturer.

### Makers Should Pay for Errors

As Mr. Bray says in his article, "Cases of faulty design do sometimes develop." In these cases, who should defray the expense of correcting the errors of the manufacturer's engineers? Certainly not the dealer, who must take the manufacturer's word that the machine is correct, as he is usually required to pay for his shipment before even breaking the seal on the car in which his machines have been shipped. Certainly not the owner, who in most cases depends upon the recommendation and reliability of the dealer from whom he buys his car.

Imagine if you can, the distributor or dealer who would contract to handle any model or make of automobile, if the manufacturers' service organization and said there was the smallest chance of his product being faulty in design.

It can readily be seen why this is one of the hardest problems with which the manufacturers' service organization has to deal. With one exception the policy of the manufacturers' service organization with whom I have had experience, has been not only the cost of installation of improperly designed parts, but in some cases the cost or partial cost of the necessary parts, is up to the dealer or owner. And of course it is a hard matter to make the dealer or owner pay these charges, which he knows he should not pay and at the same time keep him satisfied with the manufacturers' product.

### Dealer Must Take Maker's Word

If the dealer who has sold the manufacturer's product with the implicit understanding that it has been subjected to the most thorough and exhaustive test or the purchaser who has bought this product with the same understanding should be asked to defray any part of the expense of correcting defects that may develop from faulty design due to the inadequate tests and trials on the

part of the manufacturer, my sense of justice is sadly warped.

In my experience, I have found few cases of defective material and workmanship which were of particular importance, and such cases are easily distinguished from cases where material fails to perform the functions for which it was intended, or fails to give satisfaction because of faulty design, but in these few cases the fault lies with the manufacturer, and the owner or dealer should not be asked to defray any part of the expense of replacement of these parts.

### Favors 500-Mile Guarantee

Regarding the substitution of a 500-mile driving period or the 90-day period of ownership in the factory guarantee, I favor the 500-mile driving period, as every one knows that defects show up with use and not with period ownership. However, faulty design and material do not in every instance show up with 500 miles of driving. I personally know of a number of cases where the car ran satisfactorily for 1500 to 2000 miles, after which they failed to give satisfaction because of faulty design, the manufacturers' engineers admitting this to be the case. The question of whether the dealer can or cannot afford to stand the expense of installing defective or faulty designed parts in cases of this kind, should not enter into the matter.

There are few car owners of today that ask that their car be kept in repair for 90 days or for even one day. All they ask is the car satisfaction they have paid their money for and have a right to expect, the satisfaction they have been led to believe they will receive through advertisements and representations that have been made by the manufacturer and dealer. I do not believe there are many retail salesmen of today that lead their prospective purchasers to believe that they will receive any free service on their cars for any length of time and in case where the salesman does leave this impression it is up to his sales department to make good.

### Correct Design is Important

If the salesman did not give the buyer to understand that his machine had been properly adjusted and inspected and was ready for continuous service, his sales would dwindle to the place where it would be necessary for him to seek other employment.

The expense of inspection and adjustments for a 30-day or 60-day period of ownership in cases of correct designing, workmanship and material on the part of the manufacturer, is so slight that no dealer (with perhaps a few exceptions) would ask the manufacturer to defray any part of this expense.



# The Mystery of the Vanishing Oil

## How a Problem That Had Puzzled Repairmen Was Finally Solved

**B**ILL SMITH was a careful driver, as owners of cars go. That is, he was not a skilled mechanic, but he did do what the lubricating charts furnished with his car told him to do, and his car ran along without any of the annoying squeaks and groans which in so many cases attest the amateur driver. Bill liked his car, took a keen pride in its appearance and performance, and kept accurate records of gasoline, oil, and tire mileages.

Crowsdale, where Bill lived, was located in hilly country, and Bill early learned to leave his car in gear going down-hill, turning off the ignition switch if the grade was steep enough to turn the motor over against the resistance of the compression and still maintain the speed he wanted down the slope. This, Bill learned, conserved brake linings and tires, not to mention the wear-and-tear on the gear-set occasioned when a car is thrown out of gear and permitted to coast free down a hill, only to have the driver fight with the gear lever to get his engine in mesh again and continue with unabated speed when the level road is reached.

### The Car Develops Temperament

Then, almost within two days, Bill's car developed some strange symptoms. The gage on the crankcase, showing the height of the oil level within, would run along for a few days almost steady at the "Full" mark; and then, suddenly and without warning, the gage finger would point to "empty." That worried Bill; it was the first trick the car had developed which he could not figure out for himself.

First he went to his garage, had the oiling system looked over carefully and, on the recommendation of the garage-man, had the crankcase fitted with a new set of gaskets as a preventative against possible leakage there. It didn't make the least bit of difference. The oil level would seem to hold its own for as long as a week at a time—Bill's work kept

him on the road with his car most of the time, rain or shine, and his weekly mileage mounted pretty high—and then, in the midst of some long run, would come the peculiar drop of the oil level.

Bill always carried along a small can of cylinder oil "just in case," as he put it, and he found it useful a number of times when this untrustworthy oil level would tumble without warning. The total absence of oil would always be indicated by the sight-feed on the dash, so Bill never drove his car very long at a time without oil.

### Bill Gets His Irish Up

At last worry about his car's one bad habit got Bill's goat, and he wrote the factory a long letter about his trouble. The letter evidently didn't reach sympathetic hands, for the reply that came back didn't tell him a thing he didn't already know, and had already tried. That got Bill's "Irish" up, and he made up his mind he would find out what was wrong, and then show that smart Aleck up in the factory a thing or two.

A few days later Bill happened to mention his troubles to a neighbor, Walter Brown, who chanced to be a mechanical engineer and a specialist on gasoline engine construction and operation.

Brown's first question was to find out what kind of oil Smith was using. Bill's reply showed it to be a good grade—in fact, the oil recommended by the manufacturers for their car, and one which ordinarily gave good results. That eliminated the oil from the problem, or seemed to. But Brown, being an engineer, was accustomed to having inanimate things apparently contradict his theories, and he went ahead on the idea he had adopted. He asked his neighbor to draw off daily samples of the crankcase oil, collecting them after putting the car into the garage after the day's run. This Smith did, fitting a three-ounce bottle with the crankcase lubricant as instructed.

Five of the daily samples had been accumulated in this way when the crankcase suddenly went dry again. That evening, with a simple hydrometer for measuring the density, an instrument similar to the hydrometer used for testing the condition of a storage battery, Brown first compared the densities of the five samples. Number 1 showed approximately the characteristics of a sample of oil as shipped by the refinery—while Number 5 was almost as thin as water. Brown then tried a flash test of each oil sample. The first two stood up almost as well as the unused oil, Number 3 flashed with a little heating, Number 4 with less—and Number 5 would burn readily at room temperatures!

### Problem Is Solved

The problem was solved for Brown, but he had to expalin it in detail to Bill. Condensation of gasoline in the charges, drawn into the cylinders, at starting and during the long down-hill coasts, was the cause. The condensed gasoline would work past the piston rings, down the cylinder walls, drip into the crankcase, and within a week would so dilute the oil that, under the heating of a long up-hill pull, the temperature and the constant pounding of the crankshaft and the connecting rods would beat the gasoline-diluted oil into a fine spray, in which form it would work its way unnoticed out of the breather pipes and blow away.

The dilution of the crankcase oil, which takes place gradually in almost every car—especially in starting up with the choker on in cold weather—was intensified in Smith's case by unusually loose piston rings, and when a new, tight-fitting set of rings was put in, such gasoline as found its way into the crankcase lubricant was in so slight a quantity that the renewing of the crankcase oil every thousand miles, as recommended by the car manufacturer, was sufficient to insure a constant supply of lubricant of the proper consistency.

## LINCOLN HIGHWAY ISSUES ANNUAL REPORT

(Continued from page 19)

culties have been removed in several states and a safe and open route in line for rapid betterment opened from the Mississippi to San Francisco Bay. With the exception of California, Iowa is the one state west of the Mississippi through which the Lincoln Highway passes which is fully capable of itself financing the adequate and permanent completion of the road. Antiquated legislation which was the main barrier to proper highway

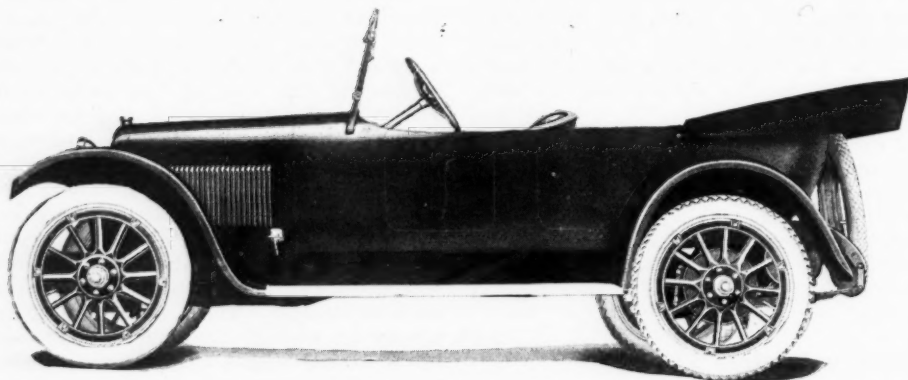
improvement in Iowa was superseded by a new law during the past year which will enable the prompt permanent construction of all of the important main line roads, including the Lincoln Way, which was established as one of the State Highways. Iowa being a rolling country, expensive preliminary grading work has necessarily preceded any paving on main routes, and the majority of Iowa's expenditures on the Lincoln Highway have been for this form of work and the construction of lasting concrete bridges. Over twenty-two miles of new

permanent grade was established on the Lincoln Highway in Iowa and more than 12 miles of it graveled for the temporary accommodation of travel. The trans-Iowa road now as in the past is a boulevard in dry weather, but should not yet be attempted while wet. Next year will see an increase in the graveled strip which is gradually reaching across the state and lifting the travel out of the gumbo. Concrete construction on the Lincoln Highway in Iowa is planned in many counties for 1920.



# Show Sees Many New Car Designs

## Exhibits at Palace and Hotels Display Numerous Improvements and Requirements



The new Nash four

### NEW NASH FOUR AROUSES INTEREST

SO much interest has been aroused by the word that the Nash company was to add a light four to its line, to supplement the present six, that the first showing of the new car at the Palace, developed into something of a reception at the Nash booth. The car is truly what it was expected to be, a small brother to the present six, in every respect it is the Nash six except for slightly smaller size. The engine is a block identical with that of the six, except for its smaller number of cylinders. Cylinder dimensions are the same as in the six, the design throughout is the same, the wheelbase is 116 in., 5 in. shorter than that of the six, the tires are smaller, being 32 by 3½ in., but they are cords; the body is a strictly five-passenger one, but with plenty of room for that number. Finish and upholstery and lines are in keeping with the Nash reputation. The price has not been announced, but it is to be assumed that it will be in the \$1200 class.

### PAIGE BUILDING ITS OWN ENGINES

INCORPORATED in a new model, known as the 6-42, Paige is exhibiting a new line designed and developed in its own factory. It is mounted on a 119 in. wheel base chassis which with the 6-55 of 1919 on the 127 in. chassis will make up the line for 1920.

The new car is different throughout from the older model, being a smaller six, and besides incorporating the new power plant, it has a single straight line propeller shaft instead of the two-piece unit with the universal joint in the large model. The engine and gearset are made in the Paige factory and the majority of other parts secured from well-known parts makers, including the Borg and Beck clutch, Detroit universals and propeller shaft, Salisbury axles, Kelsey wheels, Jacox steering, National car radiator, Gray and Davis lighting and starting and Atwater Kent ignition.

L-head construction is used in the 3½ by 5 in. power plant. The cast iron cylinder block is in a unit with the upper half of the crankcase. The head is separate and is another iron casting. The bottom pan is a stamping. The carburetor is on the left side of the block and the valves are on the right. The gases being led across the block between cylinders. The fore and aft intake passage is arranged with the bottom half in contact with the exhaust passage, having a modified hot-spot construction.

Lubrication is by combined force feed and splash.

A Yale lock is fitted to gearset for holding the gears in neutral. Final drive is by the Hotchkiss to a floating axle. The bodies are straight-line moulded types.

### MANY REFINEMENTS IN NEW LIBERTY

REFINEMENTS in the Liberty chassis are disclosed in the new model on the floor of the Palace. The car is 2 in. longer in wheelbase, but by a rearrange-

ment of the engine mounting to meet the hood, it has been possible to add 4 in. to the body. The engine has been revised to some extent to give larger water jackets and a interesting change in the cylinder head divides the head casting in three in place of the single casting, which formerly covered the entire block.

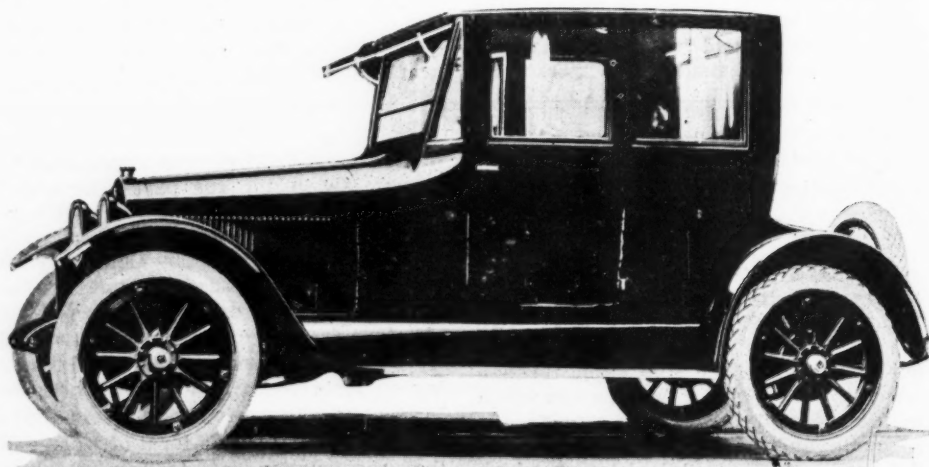
The advantage of having these three cylinder heads which are interchangeable is that gaskets are saved because it is not necessary to destroy them in removing the head. Each of the small castings has an integral lip which can be utilized for tapping to loosen the head before it is removed. The smaller head is naturally inherently more rigid so that there is less likelihood of distortion in tightening the studs. Also in manufacture the stresses are not as severe on the smaller castings.

Refinements in the oiling system eliminate the splash and make the system full pressure with the oil forced through the crankshaft and fed by spray from the lower rod bearings. The oil feed control is by a vacuum system which so controls the flow of lubricant that the greatest pressure is exerted when the engine is operating under the greatest load.

The brakes are larger on this model.

### SAXON IN NEW MODEL

THE Saxon car appears in entirely new form on a 112-inch wheelbase chassis of the Brush type, the frame is of Z-bar form, the lower flange forming the running board and the upper, the sill for the body. The engine incorporates the Brush overhead valve gear, which has the feature of being adjustable while the engine is running. It is a six-cylinder, block, cast unit power plant design, sus-



The new Liberty sedan

pended in the frame at three points, cylinder dimensions are  $3\frac{1}{2}$  by 5 in. A feature is the use of tubular members for inclosing the valve stems and for oil passage from the crankcase for lubricating the overhead valve mechanism.

A hot-spot is incorporated in the intake manifold, being so designed that the heavier fuel products are thrown into the heated recess by their own inertia, and the parts of the fuel which have already been vaporized pass through the manifold entering the heated recess, thus heavier fuel products are thrown in eliminating the excess heat which would tend to cut down the volumetric efficiency through expansion. The carburetor is a Stromberg, fed by vacuum feed from a gasoline tank on the rear.

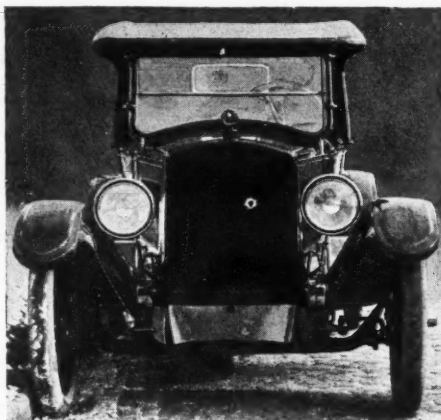
The drive is through a Detlaff clutch to a floating axle, the rear spring is the cross cantilever type familiar to brush designs. The gearset is a Covert. The car is equipped with Wagner starting, lighting and ignition.

Touring and sedan bodies are shown. The car has a distinguishing line which runs from near the edge of the radiator to the rear end of the body. It is equipped with exterior and interior door handles incorporating a patent anti-rattling feature. In the tonneau there is combined tonneau and trouble lamp with an extension cord. The touring car sells for \$1785.

#### JACKSON HAS THREE MODELS

THREE types of cars are being exhibited by the Jackson Motors Corp., all on the same chassis, known as Model 6-38. These are an open touring car, a sport car and a sedan. The car that attracts the most attention at the show is the sport car, which is equipped with a California top with windows both in the sides and in the rear. This model is fitted with steel disk wheels, and with its Keystone radiator, Streamline body and Spanish leather upholstery, is of rather fetching appearance.

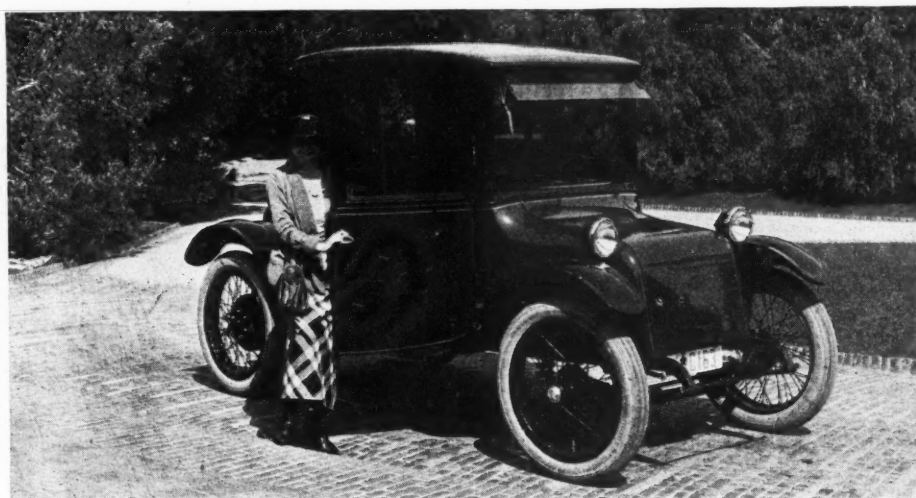
The Jackson is fitted with a Continental engine of  $3\frac{1}{4}$  in. by  $4\frac{1}{4}$  in. Fuel feed is by the Stewart vacuum system from an 18-gal. tank at the rear, where it is protected by a frame extension. There is a 1-in. Stromberg side outlet type carburetor. The Auto-Lite electric



A front-on view of the new Saxon model which attracted much attention at the Palace

system is fitted with a switch equipped with security lock.

A Borg and Beck dry plate type of clutch is used, and the gearset is a



The new Milburn electric

Covert 3-speed and reverse, selective type. Transmission to the rear axle is through a tubular propeller shaft with two universal joints. The rear axle is a Salisbury three-quarter floating.

The emergency brake is mounted on the front universal joint, the gear-set is hand-operated, as usual. The service brake, which is foot operated, is of the

contracting type and acts on 12 by 2 in. drums on the rear wheel hubs. Goodyear 33 by 4 in tires are regular equipment on the touring and sedan models. All springs are half elliptic. The Hotchkiss drive is used. The car has a wheelbase of 121 in. Power driven tire pump is fitted.

#### MILBURN HAS TWO MODELS

THE Milburn Wagon Co. exhibits two new electrics, a coupe seating four and a taxicab seating four passengers. The coupe has a wheelbase of 105 inches; the taxicab 111 inches. The taxicab has the general lines of a gasoline car, while the coupe has the appearance characteristic of the electric.

The taxicab is equipped with a 42-cell, 15 plate battery and can be operated at speeds ranging from 5 to 30 m.p.h. Mileages of from 60 to 90 are obtained from one charge of the battery. Access can be had to the battery for flushing by simply lifting the hood and

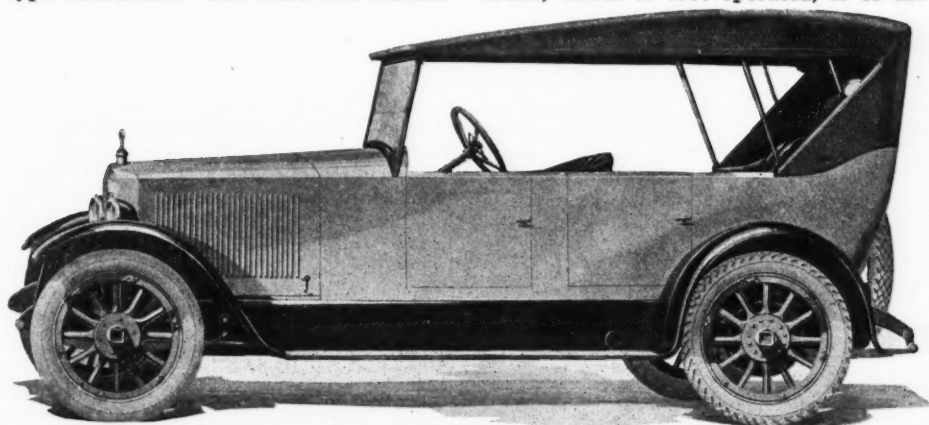
the cover on the luggage carrier space at the left of the driver's seat.

The special feature of the new electric model is the interchangeable battery.

#### ROAMER OFFERS CHOICE OF ENGINES

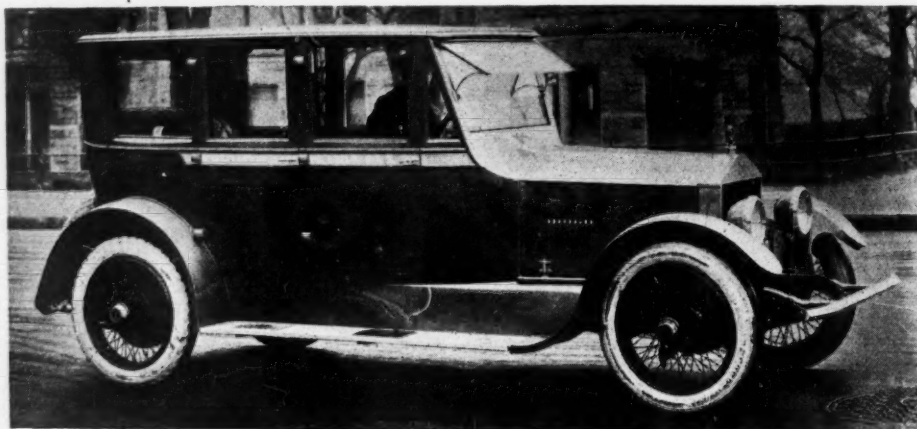
A CHOICE of either the Continental or Duesenberg engine is offered in the new Roamer, which is exhibited at the show. Those cars made by the Barley Motor Car Co. are offered in either open or closed lines, a specialty having been made of the closed type of body. Four of the closed designs are Rubay products, these being the sedan, limousine, landaulet and town car, the cabriolet, coupe and suburban are built by the Barley company. Salisbury axles, long radiator and Hayes wheels fitted with Goodyear tires.

The Continental engine used is  $3\frac{1}{4}$  by  $4\frac{1}{2}$  in., with the carburetor bolted directly to the cylinder block. This is one of the newest of the L-head engines



The new Jackson touring car





The Roamer five-passenger sedan

ade by this concern for the trade and incorporated a hot-spot construction, and a very heavy crankshaft. It is cooled by centrifugal circulating system and lubricated by combination pressure and splash. The carbureter is a Stromberg 1-in. side outlet type. Starting and lighting is provided by an electric autolite system.

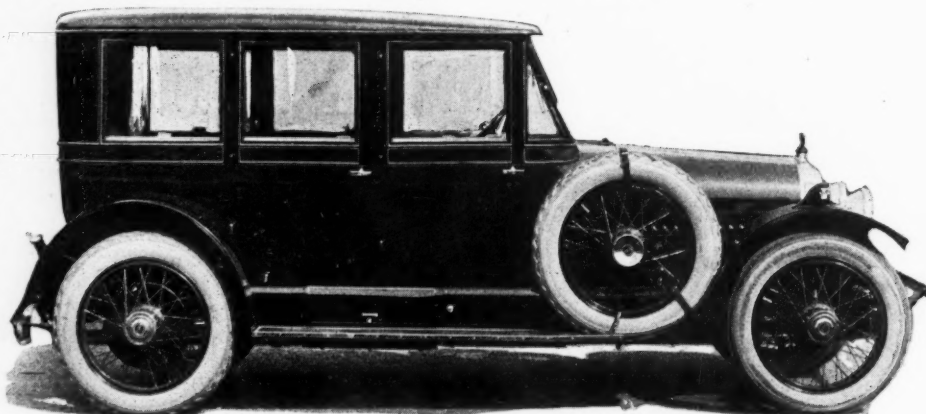
Hotchkiss drive with tubular propeller shaft and semi-elliptic springs is utilized, the rear axle being a three-quarter floating, with a housing of reinforced pressed steel. The feature of the construction of this axle is that the driving gear and differential are mounted on a separate carrier, which is bolted to the housing and removable without taking the axle from the car. The hand brake is on the front universal joint at the rear of the gearset. The wheelbase is 121 in.

Rather distinctive lines are incorporated in the body, the radiator being angular with the lower end narrower than the top. A straight line is carried from the front end of the radiator to the rear part of the tonneau running along the profile edge with a bevel. The doors are 24 in. wide and the curtains open with the doors.

#### NEW MAIBOHM IS SHOWN

A NEW Maibohm is shown by the Sandusky concern for the first time. It is a six-cylinder assembled product, incorporating the Falls engine, fitted

with Stromberg carbureter, Stewart vacuum gasoline feed, Atwater-Kent ignition and Wagner starting and lighting, with a Willard 6-volt, 94-amp. battery. The clutch is a Borg and Beck 10 in., and the gearset a mechanics' selective, providing three speeds and reverse. Final drive is by the Hotchkiss system,



The new Cunningham

through two flexible disk universals to a floating Brown-Lipe-Chapin axle.

The Falls power plant used in this car is the six-cylinder, valve-in-the-head 3½ by 4¼ in. design, with a Wyman-Gordon counter-balanced crankshaft. The engine peaks at 3990 r.p.m. It is cooled by a thermo-syphon system, and lubricated by a pressure system.

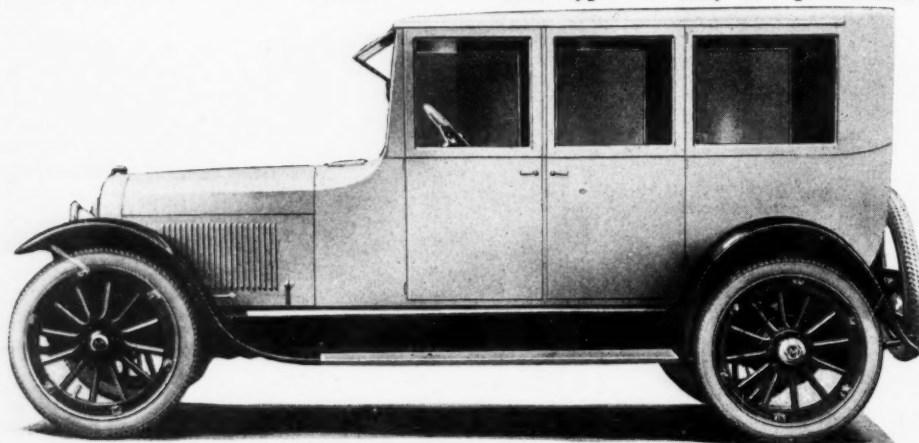
Two types of body are provided, at

improvements and refinements which are distinctly new.

This car is more fully described elsewhere in this issue.

#### MARTIN WASP IS A NEWCOMER

A NEW comer this year is the Martin Wasp, a four-cylinder car with a custom built body of unusual design. It is made by the Martin-Wasp Corp., Bennington, Vermont, and uses a Wisconsin engine 4¾ in. by 5½ in. It has a 132-in. wheelbase and carries 33 x 5 in. cord tires. Two extra tires and wheels are carried at the rear. There are four speeds forward, with direct drive on fourth speed. The universal joints are Spicer and the axles Timken. The body work is quite out of the ordinary, natural finished ash being used to a great extent in the interior. The upholstery is detachable and the seats are placed very low. The tonneau has a slanting footboard similar to that in the driving compartment. Other features of the car include a vertical, double pane windshield, polished metal instrument board and an aluminum hood. The body is finished in satin black. The car will sell for \$5000.



The new Maibohm sedan



**H. C. S. FEATURES ACCESSIBILITY**

**T**WO entirely new cars are shown in the lobby of the Hotel Astor, the H. C. S. designed by Harry C. Stutz and built by the H. C. S. Motor Car Co., Indianapolis, and the Ferris, built by the Ohio Motor Vehicle Co., Cleveland. The H. C. S. especially had been designed to render quick service. There are no grease cups and the starting motor, generator and ignition head has been placed on the right side of the engine in the most accessible position.

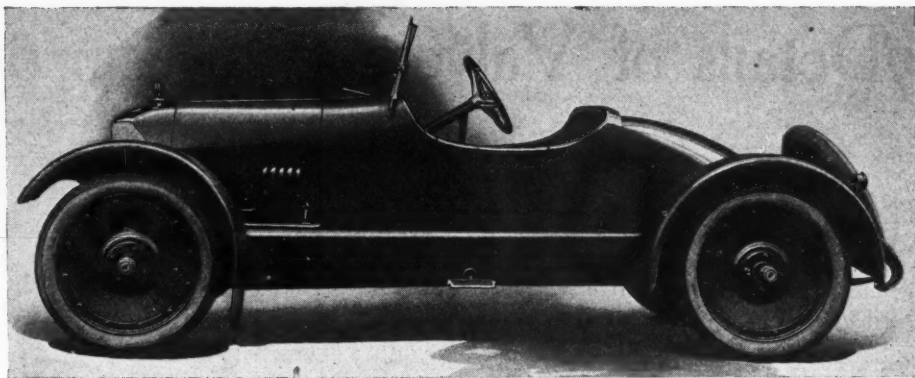
It is possible to dismantle any unit of the car, such as the rear axle, transmission, or remove the engine, steering gear, etc., without in any way disturbing the neighboring units. The car has a 120-in. wheelbase and is priced at \$2950. It is powered with a Weidely four-cylinder engine of  $3\frac{5}{8}$  by  $4\frac{1}{2}$  in., with the valves in the head. A feature of the engine is the Lanchester vibration dampener. The electric system is three-unit Delco. Tires are 32 by  $4\frac{1}{2}$  in. and the car has two extra wheels and tires, one on each side. No running boards are used, two aluminum steps taking their place. The radiator is nickel plated, and a short brace is placed back of it to the engine, instead of the usual long brace running from radiator to dash.

The seats are very low, inasmuch as the cushions are placed directly on the floor. Upholstery is hand embossed leather. The large gasoline tank is placed on the rear with pressure feed to the carbureter.

Forced feed oiling is used and the valve mechanism instead of being oiled by wicks or oil mist from the crankcase is oiled by direct pressure through a separate lead. Little refinements on the car include a spotlight bracket, integral with the windshield support, nickel-plated shield over oil cups on body to protect clothes, nickel-plated headlights, and two small lights under the hood for engine inspection. The car is finished in ultramarine blue with black fenders and wire wheels. A chassis is shown together with a four-passenger model.

**FERRIS FEATURES CUSTOM BODIES**

**T**HE six-passenger Ferris is a 130-in. wheelbase job with an aluminum custom built body. Five Distel wheels are included in the equipment with a



The Argonne, shown for first time in New York

spare carried on the left side. The engine is a Continental  $3\frac{1}{2}$  by  $5\frac{1}{4}$  in. with Splittorf magneto and Zenith carbureter. The rear axle is a floating type and the clutch Borg and Beck. A two-unit Leece-Neville starting and lighting system is used. A volt and ammeter is placed on the instrument board, and the system can be checked by merely pressing a button. Burnt out fuses are said to be impossible because of a special type of circuit breaker.

Springs are semi-elliptic with oilless bushings. Tires are 32 by  $4\frac{1}{2}$  in. cords. The six-passenger car utilizes two auxiliary seats in the tonneau and the top is lined throughout with beveled plate glass windows in the rear. It is very complete, including such features as a windshield cleaner, integral bumper with frame, trunk rack, etc.

**ARGONNE A FOUR-CYLINDER JOB**

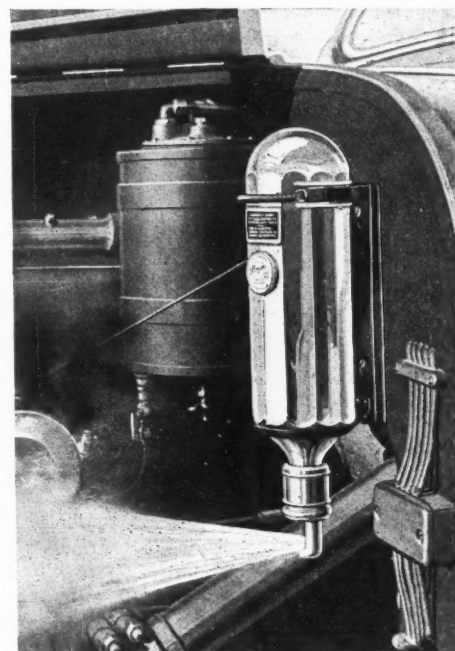
**T**HE Argonne four-cylinder car exhibited at the Commodore is a two-passenger short model fitted with a high speed engine of  $3\frac{3}{4}$  by  $5\frac{1}{8}$  in. The car is a product of the Argonne Motor Car Co., Jersey City, Mich., which will produce this model together with a four-passenger open sport model in quantities about Feb. 1. The roadster sells for \$4500 and the four-passenger \$4700. The wheelbase is 118 in.

Accessibility is one of the features on the Argonne. It is not necessary to remove the radiator, bottom of crankcase, or bellhousing to make simple adjustments or repairs, nor are any of the

lubricated parts so situated that one must crawl underneath the car for necessary attention.

**NEW BOYCE FIRE EXTINGUISHER**

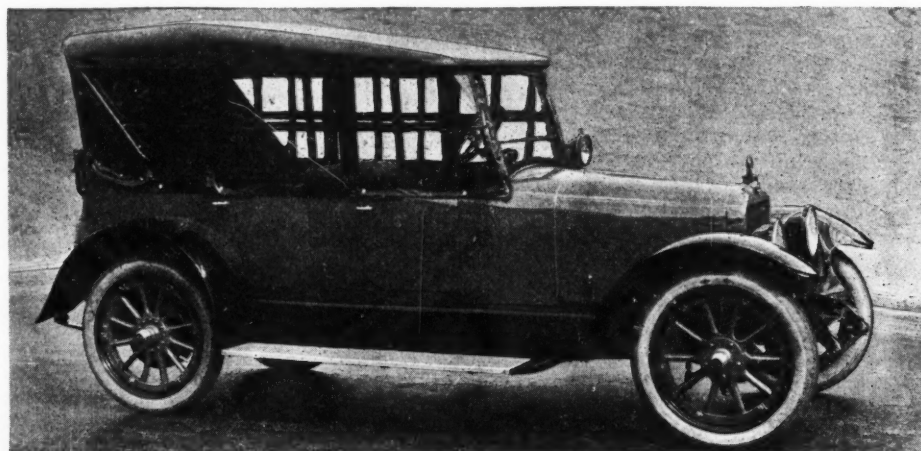
**H**ARRISON BOYCE, who invented the Boyce Moto-Meter, has brought out a new device which is an automatic sprinkler system and hand-operating ex-



Boyce fire extinguisher

tinguisher combined. It is placed under the hood of the vehicle in a position similar to that of the vacuum tank, and so arranged that it automatically extinguishes fires under the hood, but at the same time is instantly removable for use by hand in any other part of car.

The instant a flame starts under the hood, a chemical is sprayed in engine by the melting of a fusible plug, which extinguishes the fire automatically, but it is said an overheated motor will not effect its operation, nor will the chemical injure the engine. The extinguisher sells for \$6 and \$8, according to size, and is to be distributed through jobbers. A concern known as the Boyce Meter Corporation has been organized to manufacture the device and a factory in Long Island City is being equipped for an output of 8000 per day.



The new Templar model

# Details of Valve Mechanism on New Premier

## Rocker Arms Lubricated by Wick System —End of Rocker Arm Has Rolling Action

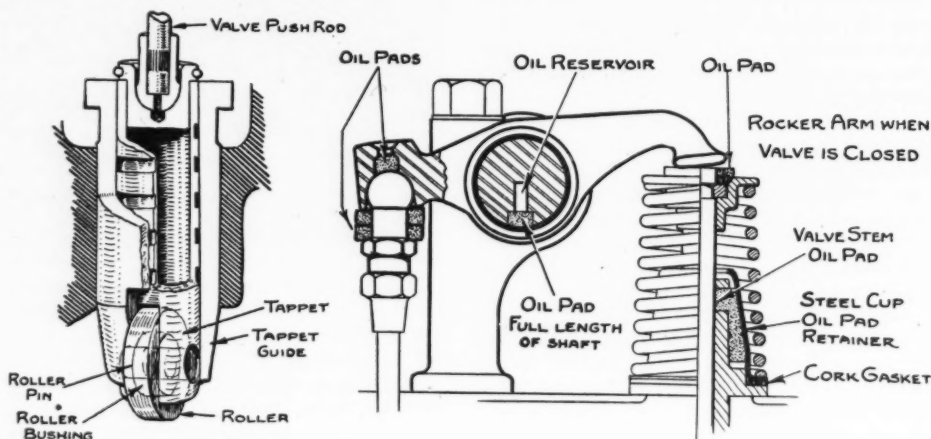
HEREWITH are shown illustrations of the valve operating mechanism of the new Premier engine. Valve clearance is usually maintained as close as possible in order to keep the valve gear quiet. Clearances of .003 to .008 in. are common practice. The Premier valve tappets have .013 in. clearance when hot, which is more than twice the average. Quietness is due to the design of the cams. Smaller clearances could be used on most engines, but is not desirable on aluminum engines on account of the variation in the length of the cylinder block. If less clearance were used the valves would be held open when the engine was cold. The cams have a toe at the point where the valve rocker-arm is brought up against the valve stem. Just at this instant, therefore, the valve gear is at rest and all the clearance has been taken out of the valve gear, so that when the valve does start to open there is no click that can be noticed. The same is true when the valve is closed. The valve gear is not necessarily as quiet when the engine is cold, but as soon as it reaches its running temperature it is correct. The temperature is reached and maintained shortly after starting the engine, due to the use of thermostatic control.

### Timing Is Conventional

The valve timing is conventional; inlet opening 10 deg. late and closing 45 deg. late; exhaust opening 46 deg. early and closing 5 deg. late. The valves have a clear port opening of 1.5 in., a lift of 0.3125 in. and a 45 deg. bevel seat. Stainless steel and high tungsten denotes that no expense has been spared for reliability.

Roller valve tappets of light construction are now used on the new Premier. They are carried in cylindrical guides, hand pressed into the case, and provided with a slot at the bottom in which the valve tappet roller slides. This slot keeps the roller axis parallel to that of the camshaft. The roller is mounted on a pin pressed into the bottom end of the tappet. This pin is 0.375 in. in diameter and is not only a tight press fit in the tappet, but also in the bushing, which is assembled in the roller. The bushing is 0.6875 in. in diameter and the same width as the roller, 0.375 in. As the bushing is tight in the pin, the roller takes bearing on the 0.6875 in. diameter of the bushing and thus the 1.25 in. tappet roller has nearly twice the bearing area that it would have if bearing on the pin. The tappet is drilled out almost its whole length in order to reduce weight. The upper end is plugged by a cup shaped piece into which the lower ball end of the valve push rod sets, contact surfaces being hardened and lapped.

The valve tappets are lubricated by oil vapor from the crankcase; the rocker-



Rocking chair action of rocker arm on Premier valve mechanism and detail of new roller valve tappet

arms by a system of wicks, and the valve stems likewise. Small wicks are fitted into the sides of the valve guides in the direction of the thrust that is imparted by the rocker-arms. Since their use, valves have been in operation for 3,000 or more miles without showing a bit of wear.

The valve rocker-arm shaft is also provided with a wick feed. A two-width slot is milled the length of the shaft, only leaving enough metal at the ends to keep it closed. A hard wick is fitted into the larger slot and the rocker-arm crowded into the shaft. This assures a tight fit of the felt along the entire length of the rocker-arm bearing surface. The smaller slot above the felt acts as an oil reservoir. It should be noted that the felt is at the bottom of the shaft where the maximum bearing pressure occurs. This has been found the most satisfactory location because it assures oil being wiped off the felt onto the point of the shaft where it is most needed, namely, on either side of the slot.

The rocker-arm end, where it contacts with the valve stem, is designed so that it has a rolling action instead of point or line contact. The end is hardened and ground, to a true radius, so as to accomplish this result. When line contact was used it tended to wear a groove in the end of the valve stem. If the valve turned during use the valve timing and clearance would, of course, be changed. The experiment was made of running a soft valve tappet of this new construction. It proved that the valve stem makes a round impression in the former instead of a line, thus showing that the tappet contact over the entire end of the valve stem. A small felt washer is placed around the top of the valve stem so that a film of oil is always kept between the end of the stem and the tappet. The entire mechanism is covered by an oil and dust tight cover.

### ROAMER IS REORGANIZED

Kalamazoo, Mich., Jan. 3—A complete reorganization of the Barley Motor Car Co. has been effected and this concern from now on will operate under the laws of the state of Michigan, succeeding the original New York corporation, which winds up its affairs this week.

Among the changes made are the cancellation of 14,000 shares of common stock of no par value and the issuance of 200,000 shares of common stock, each of \$10 par value.

Five thousand shares of preferred stock at \$100 a share are superceded by an issue of a like amount of preferred stock at the same value. Of this issue there is \$300,000 holding in the treasury.

The Kalamazoo Industrial Realty company, formed for the purpose of taking over the factory and site occupied by the Barley Motor Car company, will pass out of existence, all its holdings being taken over by the parent company.

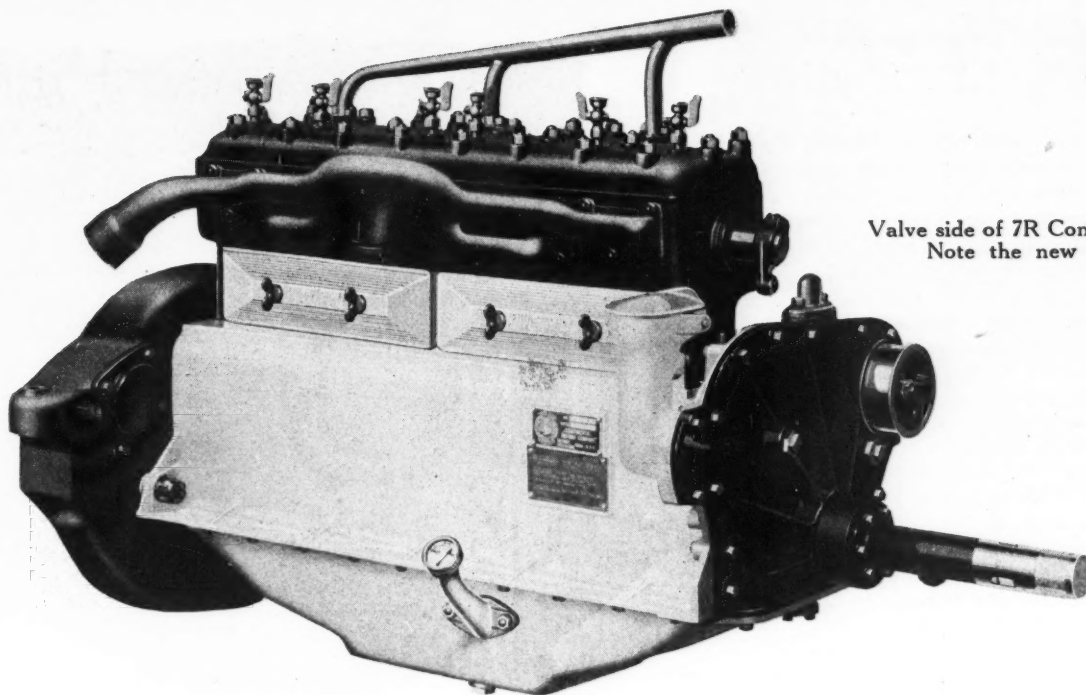
A. C. Barley, president of the company, announces that all holders of the original no par value common stock will receive for each share ten shares of the new issue, while the preferred stock is reissued share for share.

### NEW AXLE COMPANY IN PROSPECT

Cleveland, O., Jan. 6—A new axle company will be organized by retiring officials of the Torbensen Axle Co., Cleveland, O. The men instrumental in organizing the new company are J. O. Eaton, former president of the Torbensen company; C. R. Ochs, formerly vice-president of the same company, and C. D. Torbensen, former chairman of the board.

These officials of the Torbensen company resigned recently when the interest in the company formerly owned by the Republic Truck Co., passed into the possession of John N. Willys of the Overland Co.





Valve side of 7R Continental engine.  
Note the new manifolds

## Continental Issues a New Engine

Model 7-R Is Marked by Great Care in  
Design and Embodies Many Improvements

**T**OOLING up operations on a much more elaborate scale than for any Continental engine yet produced are now proceeding at the factory for the Model 7R. Shipments have already been started on a few of these engines, and with the completion of the tooling work at the factory and the arrival of the special machinery, the factory ought to be in full swing on these engines by Sept 1.

The new engine is a  $3\frac{1}{4}$  by  $4\frac{1}{2}$  six-cylinder model, unit powerplant type, with removable cylinder head and aluminum crankcase. It incorporates many features new to Continental practice, although not of a radical nature. The vaporizing intake manifold, full pressure feed oiling system, with gear type oil pump, and a number of detailed refine-

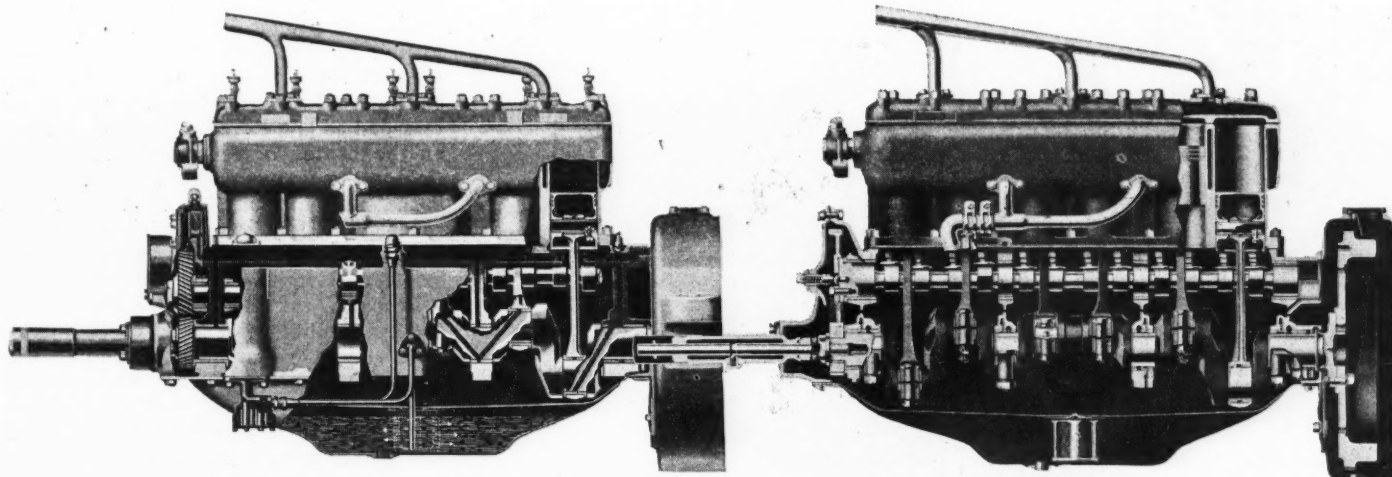
ments are claimed to give this engine a performance which has not been equaled by even the best of the previous products of this concern.

From a standpoint of life and performance, provisions have been made in the way of a four-bearing crankshaft, a four-bearing camshaft, an entirely new system of crankshaft balancing, long connecting rods, long pistons, a balanced timing gear train, large valves with long bearings for the valve stem guide and push rod guide, an improved water pump, a very accessible oil filler and an accessible layout of the valve spring chamber so that the cover plates are readily removable and the tappets easily reached for adjustment.

Structurally, the engine is intended for

a main frame mounting with a three-point suspension. The rear supporting arms being integral with the flywheel housing giving a width between the supporting bolt centers of  $24\frac{1}{2}$  in. The front supporting member rests upon a front cross-member of the chassis, the third point of suspension being around the support and cast integral with the timing gear case cover. Materials used are conventional, with cast iron for the cylinders, cylinder head, flywheel housing, with an aluminum crankcase and a pressed steel oil pan. The weight of the engine totals 660 lb.

Peaking at 2600 r.p.m., the engine produces 55 hp. at this speed. At 1000 r.p.m. it produces 26 hp., and at 1000 ft. per min. piston speed, 34 hp. This corresponds to an r.p.m. of 1333. The engine displaces



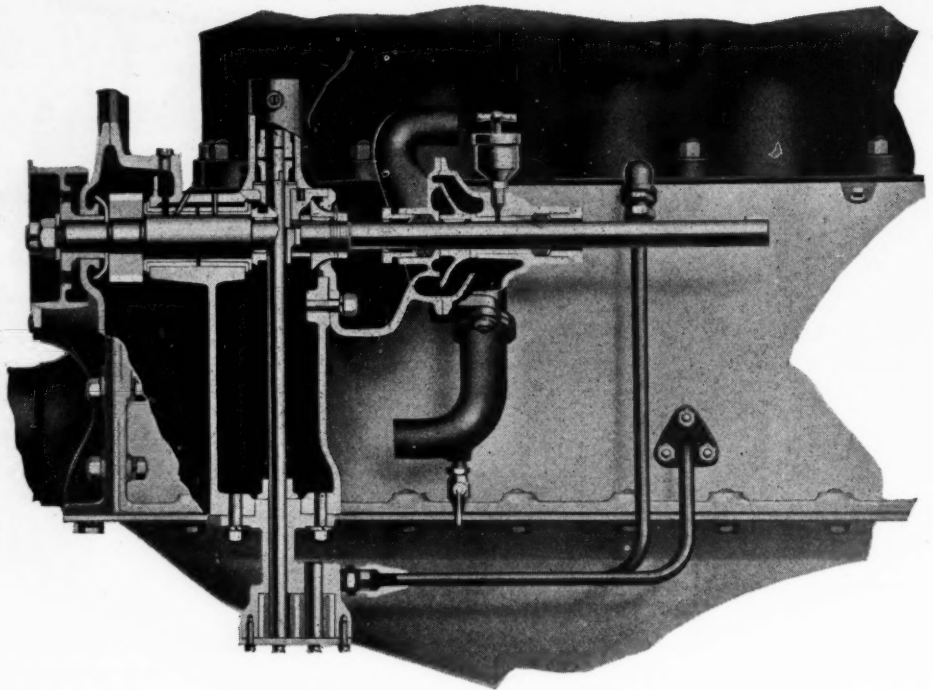
Left, the oiling system of the new Continental; right, side sectional view of engine showing heavy crankshaft and camshaft



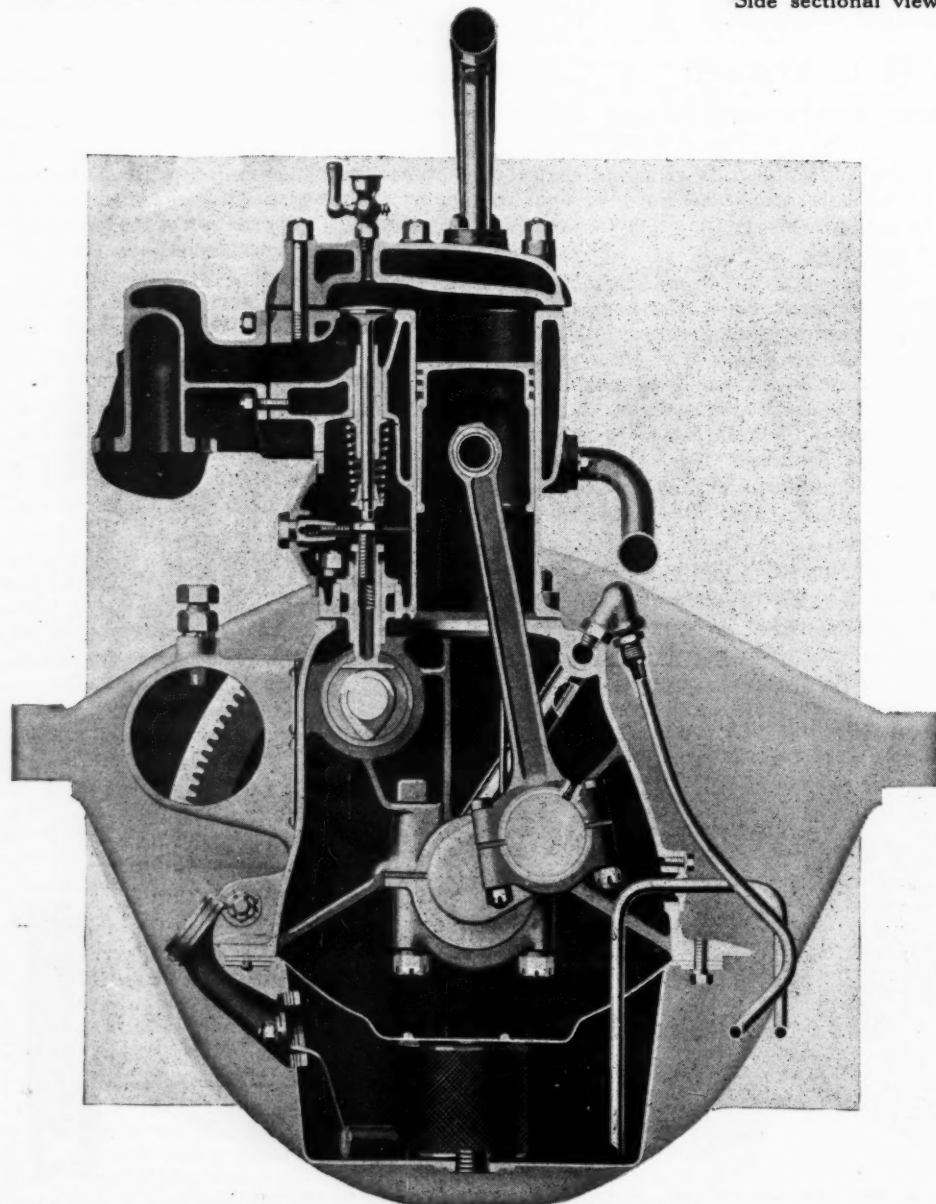
286.8 cu. in., or 37.33 per cylinder. The combustion chamber is 10.8 cu. in. per cylinder, the clearance ratio being 22.5 per cent.

The cylinder and valve layout is along conventional L-head lines, with the valves on the right side of the engine. The exhaust manifold is also on the right, with the intake cast integral with the exhaust, giving the hot-spot type of construction. The cylinder casting is very simple constituting nothing but the barrels and the water jacket. This provides a light casting to handle and one which is readily machined.

The pistons are cast iron,  $4\frac{1}{8}$  in. in length, with three eccentric rings all mounted near the top of the piston. These rings are  $\frac{1}{8}$  in. in width. The connecting rods are  $10\frac{1}{2}$  in. long, machined all over, and providing a piston pin bearing of  $\frac{7}{8}$  in. diameter, the pin length being  $1\frac{3}{8}$  in. The big end bearing is  $2\frac{1}{4}$  in. in diameter and  $1\frac{1}{8}$  in. long. The crankshaft is exceptionally heavy, being  $2\frac{1}{4}$  in. in diameter at all bearings, the length of these being from front to rear, respectively,  $2\frac{5}{8}$ ;  $1\frac{1}{8}$ ;  $1\frac{1}{8}$  and  $3\frac{1}{8}$ .



Side sectional view of Continental 7 R



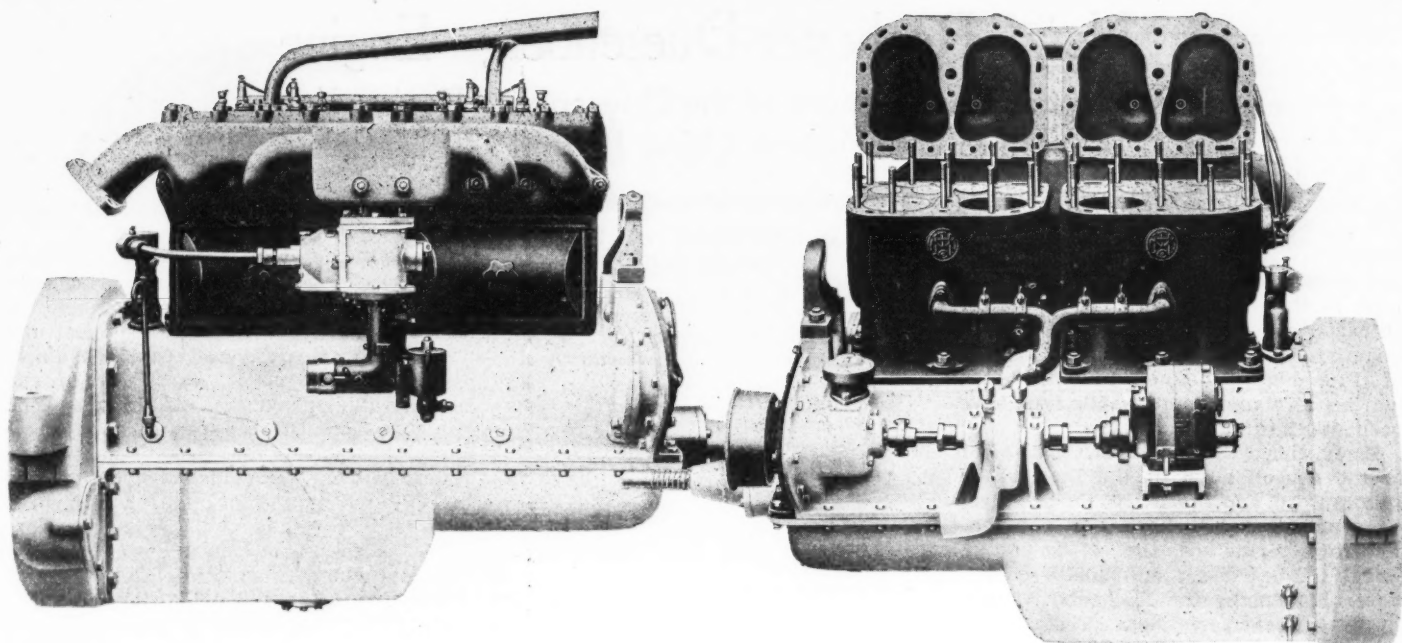
Front sectional view of Continental 7 R

Four bearings also support the camshaft, which is driven by a helical gear train. Camshaft diameter is  $2\frac{1}{4}$  in., the dimensions at the bearings being, front to rear, diameter and length,  $2\frac{5}{8}$  by  $2\frac{1}{8}$ ;  $2\frac{3}{8}$  by 1;  $2\frac{1}{4}$  by 1 and  $2\frac{3}{8}$  by  $1\frac{5}{8}$ . The cams act directly upon hollow mushroom tappets into which the adjusting stud, which acts against the bottom of the valve stem, is screwed. The valves are interchangeable, having  $1\frac{5}{8}$  in. head diameter and a  $1\frac{1}{2}$  in. diameter of clear opening. The valves are 45 deg. poppet type with a lift of 5-16 in. both for exhaust and intake.

The oil from the pump is fed under pressure through the drilled crankshaft to the main bearings, connecting rod lower end bearing and timing gear case. There are no individual splash troughs beneath the rods, but spray lubrication from the ends of the rods takes care of the cylinder walls and pistons. All the oil drains back through a cylindrical screen to the reservoir in the bottom of the pan, this being separated from the crankcase proper by an inner pan, allowing oil to reach the reservoir only through the strainer. The deepest part of the crankcase, instead of being at the rear end as is generally the case, is nearer the center of length of the engine. One of the features of the oiling system is the external mounting of the oil pump, rendering it highly accessible, as may be seen in the illustrations of the engine exterior.

Probably the most noticeable feature of the cooling system is in the triple brass outlet water pipe. Another feature is the more efficient water pump, rotating at  $1\frac{1}{2}$  times crankshaft speed. The 16-in. fan is driven by a 4-in. diameter pulley with a  $1\frac{1}{4}$ -in. flat belt. The fan pulley is mounted on the end of the water pump shaft. The driven pulley is

(Continued on page 43)



Two side views of the Hercules engine. A removable head made in two sections is an accessibility feature. Note the low outlet for water pump, enabling a drain in this position to remove every particle of water.

## Hercules Has New Heavy Duty Engine

### Strong Proportions of All Parts Are a Feature of Latest Model Issued by Firm

THE new heavy duty Hercules engine is noteworthy, because of the unusually heavy proportions of all its parts. Of four cylinders, with the block in two sections, having a bore and stroke of 4 by 5½ in., this engine develops considerably more than its rated power of 27.2 hp. Full forced lubrication and a five-bearing crankshaft are some of its outstanding features. The crankshaft is made of chrome nickel, drop forged and heat treated, of unusually ample proportions. This design, coupled with the generous bearing surfaces provided is claimed by the Hercules engineers to be positive proof against disalignment or whipping of the crankshaft.

The oiling system is of the high pressure dry base type, the oil being drawn from a reservoir placed at the bottom of the crankcase and forcibly carried into the main oil lead, distribution is provided for, to each bearing. A very substantial gear pump is employed and located most accessibly. Oil under pressure is carried up to the wrist pin bearings, as well as a stream constantly pouring over the timing gears.

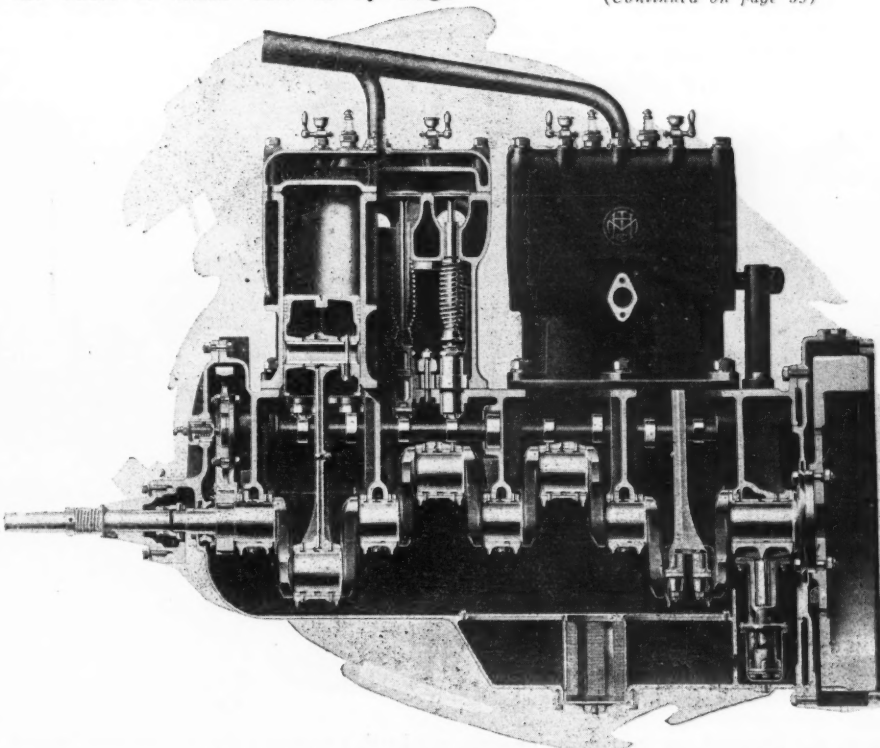
Especial attention has been given to the design of the cylinder block—valve arrangement, water jackets and gas passages, in order to particularly fit the Hercules for the consumption of low grade fuel. The water jackets are carried to the base of the cylinder block and a liberal space is provided around each cylinder barrel, valve pocket and port plug opening, so as to insure freedom of circulation, uniform wall temperature and absence of hot and steam pockets.

The five liberal main bearings are a special feature of the Hercules. Bearing pressures per unit area are claimed to be reduced to an unusual degree. All bearings are of liberal length. The bronze bearings are lined with babbitt. Laminated shims provide means for taking up the wear. The end thrust of the shaft is taken care of by large

flanges on each end of the rear bearing.

The piston design is of the long trunk type of such construction as to be inherently in balance. Four concentric type rings are provided to maintain even wall pressure throughout their entire circumference. The piston pin is locked firmly in the piston bosses, the bearing being in the upper end of the connecting rod

(Continued on page 35)



Sectional view of Hercules engine showing the large 5-bearing crankshaft. Roller camshaft tappets are used.



# New Rochester-Duesenberg Engine

Product a Development of the Duesenberg Racing Engine  
—Three Car Makers Using It for 1920 Models

**D**UESENBERG engines have been a live topic of conversation in the automotive industry for several years, but various conditions have arisen from time to time to stop production of this rather remarkable type of engine in quantity, hence but a limited number of Duesenberg engines in either the marine, airplane or automobile type have been put into actual service.

Early this year, however, just prior to the consolidation of the Duesenberg Motors Corp. and the Willys Corp., a deal was consummated whereby the manufacturing rights of the 4 by 6 in. Model G-Duesenberg automobile engine were obtained by the Rochester Motors Co. of Rochester, New York, who, for several years, have been building airplane engine parts for Curtis and other airplane engine builders and who, as a consequence, have a very splendid reputation for turning out precision work. The Rochester Motors Co. took the Model G-3 motor and made several changes in it, some of which were suggested by Fred S. Duesenberg himself, others were developed by their own engineering department. Eventually, satisfied with their tests that the redesigned model was O.K., production plans were formulated and the job was tooled and jigged for quantity output. Early in December the first production on this schedule began coming through and now a steady stream of engines is coming out of the Rochester plant every day. Three cars have contracted with the Rochester Motors Co. for this Model G-3 Rochester-Duesenberg engines for their 1920 models—the Meteor—the Revere and the Roamer. The rapid production of these engines is now enabling each

## DUESENBERG ENGINE SPECIFICATIONS

*MODEL G; bore and stroke—4 by 6 in.*

*CYLINDERS—Cast in block.*

*PISTONS—Magnalite aluminum alloy.*

*CONNECTING RODS—I-section, vanadium steel.*

*CRANKSHAFT—Two-bearing.*

*CRANKSHAFT BEARINGS—2½ in. diameter.*

*INTAKE & EXHAUST VALVES—2½ in. diameter.*

*LUBRICATION SYSTEM—Force-feed.*

*WATER PUMP—Impellor type.*

*OIL PUMP—Gear type.*

one of the car manufacturers to satisfactorily take care of the accumulated orders on their books for their cars equipped with Duesenberg engines.

The engine itself is a development of the Duesenberg racing engines which have created such a remarkable record on the

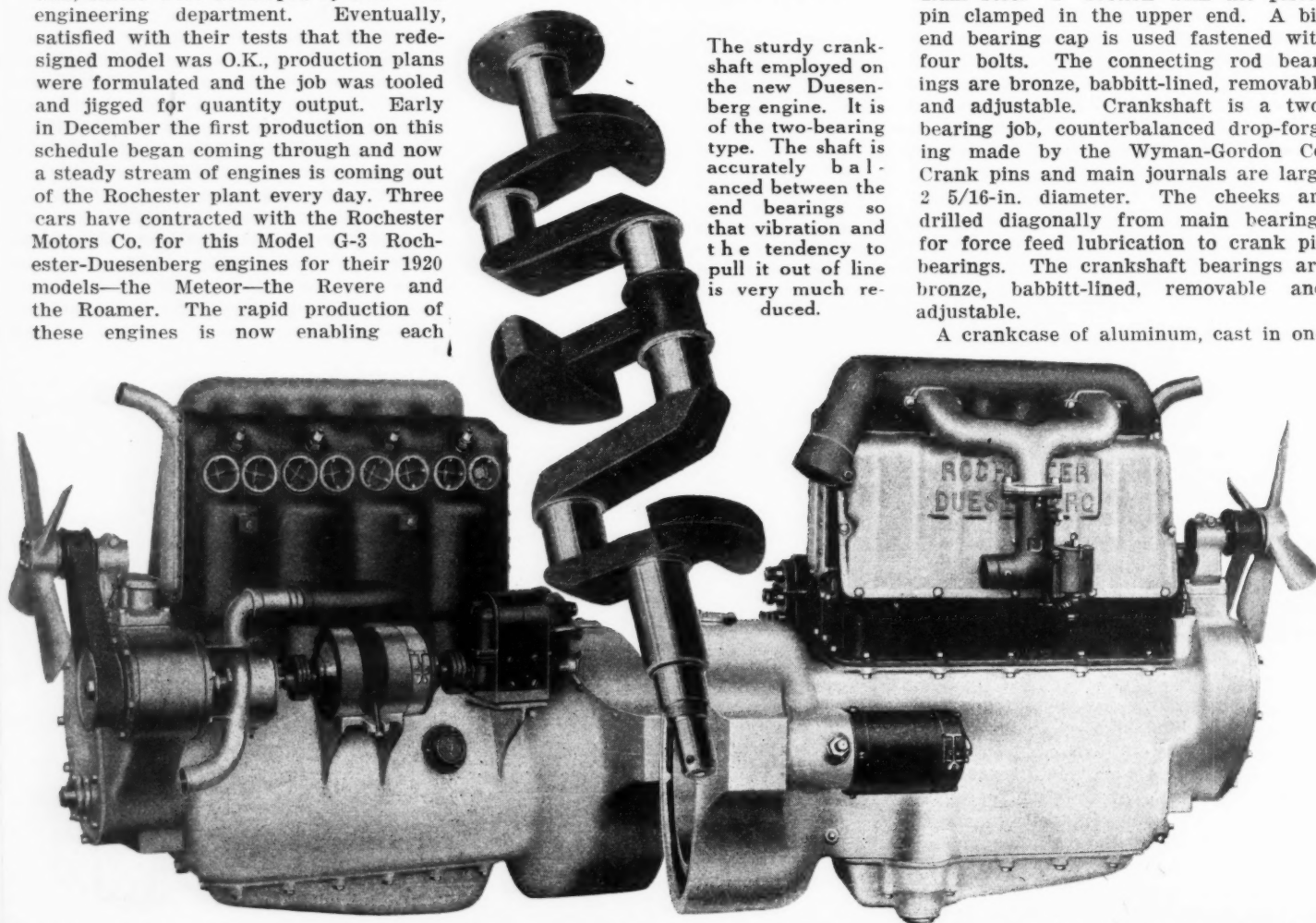
American speedways during the past four or five years.

The model G-3 motor has the same unique horizontal valve action characteristic of all Duesenberg engines. It is a four-cylinder 4 by 6 in. compact unit with the cylinders cast en block ample water jacket space, especially around the valve chambers. Aluminum end plates fastened with cap screws enable easy access to water jacket for cleaning out sediment, etc. This construction also facilitates setting of cores and insures uniform wall thickness. Pistons are cast from magnalite aluminum alloy, light in weight but of great strength. The piston head is very heavily ribbed to dissipate heat and to insure uniform expansion. Each piston with its wrist pin and connecting rod is painstakingly balanced with others of the same motor. Three piston rings are used, Burd high-compression on top and two American Hammered rings underneath. The piston pins are Shelby steel tubing pack hardened and ground.

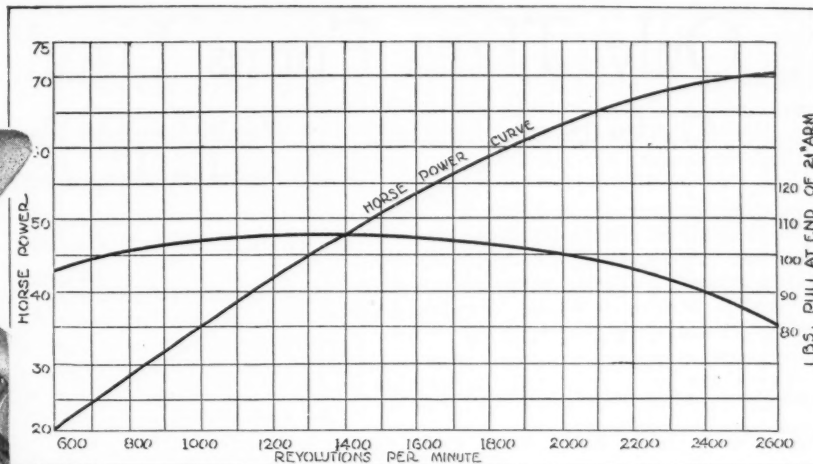
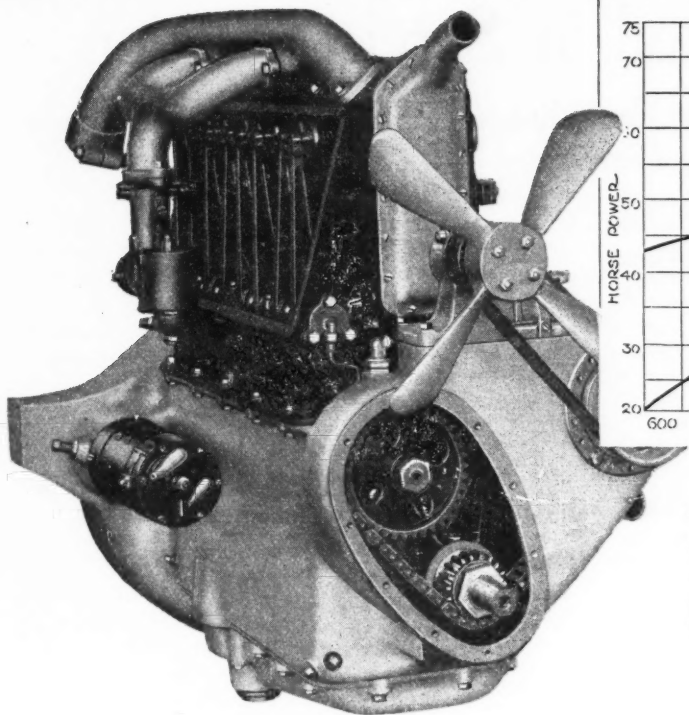
Connecting rods are drop-forged vanadium steel "T" section with the piston pin clamped in the upper end. A big end bearing cap is used fastened with four bolts. The connecting rod bearings are bronze, babbitt-lined, removable and adjustable. Crankshaft is a two-bearing job, counterbalanced drop-forging made by the Wyman-Gordon Co. Crank pins and main journals are large 2 5/16-in. diameter. The cheeks are drilled diagonally from main bearings for force feed lubrication to crank pin bearings. The crankshaft bearings are bronze, babbitt-lined, removable and adjustable.

A crankcase of aluminum, cast in one

The sturdy crankshaft employed on the new Duesenberg engine. It is of the two-bearing type. The shaft is accurately balanced between the end bearings so that vibration and the tendency to pull it out of line is very much reduced.



Side views of the Duesenberg four-cylinder engine. In this engine, the valves are located in the top in a horizontal position and are actuated by long rocker arms pivoted on the side of the engine.



The engine with a cover plate removed, showing the long rocker arms. Camshaft drive is by chain. Above the power curve of the engine. The peak occurs at 2600 r.p.m. at which point over 70 hp. is developed. It will be noted that the rated hp. of 25.6 is exceeded almost three times, which is rather remarkable for an engine of this size

piece, is used, the front bearing being integral with the crankcase and lined with a babbitt bronze, one-piece bearing. The rear bearing is split for adjustment and is contained in a conical aluminum housing which in turn is accurately fitted and bolted to a recess in the crankcase, which is generously ribbed throughout. The whole assembly is designed particularly for strength and accuracy in alignment. The lower pan is likewise of aluminum and is bolted to the crankcase.

Intake valves are carbon steel, 2 3/16 in. diameter. Exhaust valves are tungsten steel, 2 3/16 in. diameter.

Valve springs are single coil with a spring retainer secured by means of split taper cones. The valve rocker arms are

drop-forged nickel steel, fitted with cam roller at lower end and adjusting screw at upper end. The fulcrum bearing bushed with Non Gran bronze. Rocker arm shaft is Shelby steel tubing, pack hardened and ground to size. Each shaft supports eight rocker arms and the entire valve actuating mechanism is enclosed in an oil-tight chamber with a removable cover plate.

Auxiliary drive—the camshaft, water pump, generator and magneto are driven by a silent chain from the gear on the crankshaft and is provided with a simple but effective means of adjustment. The chains and gears are fabricated from a particularly tough steel, by the Link Belt Co., the whole forming a silent and very efficient drive. Cam-

shaft is of carbon steel, drop-forged with cams and helical pump gear integral. The shaft is finished all over, pack hardened and ground. Camshaft bearings are of Non Gran bronze.

The oil pump of the gear type driven from integral gear on camshaft. It is readily removed as a unit for inspection, cleaning, etc.

The lubrication system is force feed to main, connecting rod, camshaft and rocker arm bearings. Overflow from relief valve in line feeds silent chain, timing gears and pump shaft. Pistons, piston pins, cams and cam rollers are lubricated by spray.

The water circulating pump is of the impellor type and has large capacity.

## Hercules Has New Engine

(Continued from page 33)

and properly lubricated from the pressure oiling system.

The connecting rod is of such design and length as to be absolutely rigid under all stresses, making an assembly of great strength, yet producing exceedingly low reciprocating stresses. The connecting rod bearings are of the bronze backed babbitt lined type the same as the main bearings, and so grooved to permit the best possible distribution of the lubricant at the time when bearing pressures are greatest.

The removable oil pan permits accessibility to all bearings. The one piece separable bell housing construction provides a very substantial support for a unit power plant as well as providing the means of supporting the engine to the truck or tractor frame work. Three

point suspension is used, the front end being a trunnion concentric with the crankshaft, making a true three-point suspension.

## GOOD ROADS HELP TRUCKS

Portland, Ore., Jan. 6—How good roads increase demand for motor trucks is interestingly demonstrated by an increase of 63 per cent in Oregon motor truck registration for 1919 over 1918.

Highway work now actually under contract in Oregon totals \$21,000,000. The greater part of these contracts were let this year. Registration figures complete to the end of October show that 5158 motor trucks are registered in the state, as compared to 3066 trucks for all of 1918. This does not include Ford trucks, of which there are 3604 registered, as compared to 2277 for 1918, making the total number of all varieties of trucks in the state at present 8762, against 5343 in 1918.

## TO MAKE TURBINE ENGINE

New York, Jan. 6—The manufacture of a turbine drive for passenger cars has been undertaken in Newark, N. J., by the Radcliffe Turbine Drive Co., Inc., with offices at 177 Broadway, New York. The company already has a considerable force of men at work and expects to have its product on the market in March next.

The turbine drive, according to its inventor, C. R. Radcliffe, will be manufactured for trucks later on. The appliance will be shown at the New York and Chicago shows.

Arthur M. Day, recently returned from service with the American Expeditionary Forces, is president of the company; William A. Lobb is vice-president; George F. A. Olt, secretary, and Charles W. Diehl, treasurer. Radcliffe is chairman of the executive committee, and A. Elliott Ranney, a former automobile man, recently returned from overseas, is one of the stockholders and promoters.



# Only Three Forms Used in Service Station

## Clydesdale Distributor in Philadelphia Establishes Extremely Simple System in Handling Repairs

THE simplest service station and repair system in Philadelphia, as regards forms employed, is in use by the firm of Gawthrop & Wister, distributors in the Philadelphia territory for Clydesdale trucks.

There are more than 200 Clydesdales in this immediate territory, which comprises eastern Pennsylvania, central and southern New Jersey and the State of Delaware, and through its inspectors the firm tries to keep in constant touch with its customers, both on the road and in its garage. As the force is comparatively small the simplest possible office and shop system, covering service, was worked out.

### In Heart of Motor District

The building, at 12-16 South Twenty-first street, is in the heart of the Market street truck and passenger car section and the firm's business is concentrated, being transacted on two floors—the first and second. The service station and garage are in the rear of the sales department, the repairshop and stockroom being sections of the service station, which in its entirety has 8,000 square feet of floor space. The stockroom, which contains 1,900 bins of steel unit construction for the reception of a stock of parts varying from the minimum of \$15,000 in value to \$17,000, is separated from the rest of the department by heavy wire and wood partitions.

A large electrically operated elevator connects the service station with the storage department on the second floor, which has a capacity of 75 trucks.

In stock also are carried in quantity service radiators, magnetos, carbureters, transmissions and wheels, all of which are rented by the day.

The service station is in charge of a foreman and the stockroom has a manager. The service station force, including mechanics, consists of seven men. For a service car, a converted Ford runabout with open express body, is used. In difficult emergency cases, such as a wreck, a portable crane mounted on a Brockway truck stripped chassis, is run out on the road. When the Ford is used, jacks, towing chain and a block and tackle, with wrenches, are taken along loosely in the car.

Gawthrop & Wister's service system forms consist of "three aces," and through these cards they are enabled to take all the service tricks they can take care of at the present time.

The forms consist of:

- 1—Repair Department Slip, 5½ by 9 in.
- 2—A Workman's Time Card, 4 by 7 in.
- 3—A History Card, 6 by 9 in.

These suffice for the entire service transaction.

By K. HERRICK

The Repair Department Slip is made out in duplicate, the white original being held in the service department and a blue carbon copy being sent to the manager, J. F. Wister, where it is filed, while still "in work," in a special cabinet in

### THESE THREE ACES TAKE ALL SERVICE TRICKS.

**SHORT-CUT FORMS in the System of Gawthrop & Wister, Philadelphia:**

1. Repair Department Slip.
2. Workman's Time Card.
3. History Card.

the manager's immediate office and after the job has been completed, in a cabinet with wide drawers just outside the glass partition wall of the manager's office.

This especially convenient form has entries as follows:

Repair Order Number, Date, Charge to, Ordered by, Date Wanted, Date Promised, Repairs Required, Parts Furnished, Tested Out by.

Just above the dotted line for the signature of the owner of the car, and of the representative of the owner, should one bring in the car in his stead, is the important statement, "The above parts received, repairs and adjustments made, and car is running satisfactorily."

### Contains Room for Entrees

It will be noted that this slip, under the "Parts Furnished" entry, contains spaces for a list of such parts, thus eliminating at least one form generally used by service stations. This "short cut" is highly regarded by the firm, as it simplifies both kinds of clerical labor—filling out and filing. In addition, it saves time by abolishing the need for reference to an extra form when occasion calls for looking up the card, or slip, in the file.

The Workman's Time Card, of which

**REPAIR DEPARTMENT**

No. \_\_\_\_\_ Date \_\_\_\_\_

Charge to \_\_\_\_\_

Ordered by \_\_\_\_\_

On \_\_\_\_\_ Promised \_\_\_\_\_

Repairs required \_\_\_\_\_

Parts furnished \_\_\_\_\_

Tested out by \_\_\_\_\_

The above parts received, repairs and adjustments made, and car is running satisfactorily.

Date \_\_\_\_\_ Signed \_\_\_\_\_

For \_\_\_\_\_

Repair department slip used in short-cut system of Clydesdale distributor in Philadelphia. Note that this form eliminates an extra card for recording parts furnished for the work. This is made out in duplicate.





# Tractor Conditions in the Empire State

BY FRED M. LOOMIS  
(Motor Age Editorial Staff)

## In Two Parts—Part I

[Mr. Loomis has for the last few months made extensive investigations of the conditions of the tractor industry in various parts of the United States. With his wide acquaintance among tractor dealers, manufacturers and users due to his long experience in this field, he has had exceptional opportunities to obtain a clear insight into the true situation of the industry.]

MOTOR AGE this week is presenting the first report of these conditions in the belief that a summary of the situation in one part of the country may prove of value to dealers in other sections of the country. Mr. Loomis will make reports on the situation in other sections of the country in succeeding weeks and in addition will "cover" for MOTOR AGE, the various tractor shows and demonstrations throughout the coming year.]

How price dominates the situation is evident from the degree of interest being taken in the expected coming of the Samson. The \$650 advertising done by this company some months ago made a deep impression upon the minds of the farmers of this section and whenever the company gets ready to introduce the Samson here it will meet with a hearty reception. There is intense curiosity about it and I am convinced from what I have been told that many farmers are deferring buying a tractor until they can see a Samson.

Apparently there was a time when the Case was measurably popular in this section. This was before the days of the Fordson and while the I. H. C. was selling the Mogul and the Titan. But to all present appearances the Case organization has gone pretty well to pieces and

now there are nothing but vestiges of former popularity left.

As said before, the two most popular tractors are the Fordson and the 8-16 International. For the most part the latter is sold by implement dealers, with here and there a motor car dealer agent. The exact reverse is the case with the Fordson. Of the 66 present producing dealers in the state only about 10 per cent are implement dealers, all the others being motor car dealers. I am assured that the Moline organization at the present time is about 50-50.

Taking the situation as it exists today the automotive interests are the stronger in the distribution of tractors and they bid far to become even stronger as time goes on. In other words, the motor car dealer is making good, generally speaking, with the tractor in New York. At any rate, such has been my observation as far as I have been permitted to see.

"I have about made up my mind to devote myself to tractors, tractor implements, motor cars and trucks, and let the horse-drawn implements go," says H. E. Slocum, surviving member of the firm of Secord & Slocum, Leroy and Batavia, N. Y. "There's nothing in the horse-drawn stuff any more; it takes lots of room, lots of time, and the dealer can't make any money on it."

After selling between 150 and 175 tractors in Genesee county during the last six years this old implement concern sees that the future for the dealer lies along power farm equipment and automotive lines.

The firm of Secord & Slocum is a pioneer in the tractor business in this section. Commencing at Leroy, N. Y., about six years ago as tractor dealers, although the senior member of the firm had been selling implements for years

before that, the company began pushing tractors as they were at that time. It gathered a lot of experience and grief, particularly the latter, during the early days. All kinds of machines were tried out, the list sold during the six years almost covering the number of better known tractors adaptable to farming in western New York during that period. As for instance, during 1918, when 42 machines were sold,

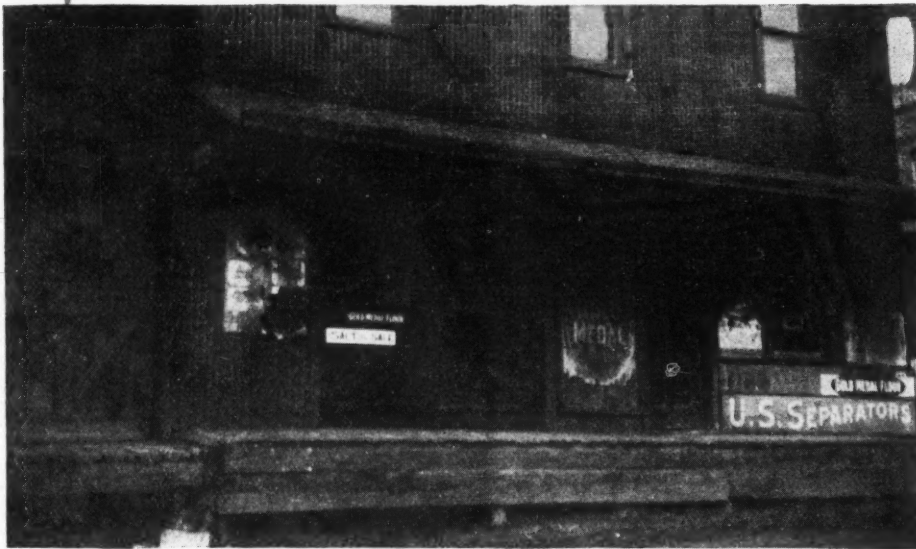
A SMALL tractor and a small price appear to be the two chief factors which are determining the course the tractor business is taking in the Empire State. At least that is the conclusion I have reached in that section of the state through which I have traveled recently. There are some large tractors, of course, but nearly all of them are owned by threshermen who still hold sway in this part of the country. Threshing in New York is still a distinct business and as large separators are commonly used it takes large tractors to operate them.

The farmers, however, I am told, in a proportion of about 9 to 1, want a small two-bottom tractor and they do not want to pay any more for it than they have to. That fact in a way explains why over half of the 6000 tractors now in use in New York are Fordsons. That and the fact that in putting the Fordson on the farms of New York the most scientific and intelligent scheme of selling has been employed that has been put behind any machine. I am convinced of the certainty that had Thomas J. Northway, the Fordson distributor in this state, employed the same methods in pushing any other two-plow tractor he has employed in pushing the Fordson, he would have been equally successful. It is merely fortunate for the Fordson that he had that machine. And this merely goes to confirm what I have found to be the case in many other sections of the country, namely, that it is the selling organization and the ability displayed by it that sells tractors. Other things being equal, the tractor itself has very little to do with it.

I came east from Buffalo to Rochester, then south to Elmira, and am leaving the state at Binghamton. Along this route I have found only three tractors which cut much figure on the farms. These are the Fordson, the International and the Moline-Universal. The two former sell largely on price, the latter because of its specialized versatility. The sales resistance the Moline must overcome is the strongest for the reason that it costs the most money. Otherwise it would be as popular as either of the other two.



This is the sales and service room occupied by R. M. Walker, one of the leading tractor dealers in Batavia, N. Y. Walker is dealer for Fordson tractors and Ford cars



Here is a salesroom and service station in Batavia, N. Y., occupied by E. J. Saleway. Mr. Saleway, in addition to selling the Case tractor, also handles a line of motorcycles as well as doing a flour and feed business

the company handled the Chase, the Cleveland, the Waterloo Boy, the 8-16 International and the Titan. This year, with 34 tractors sold, the line consisted of the two I. H. C. machines and the Waterloo Boy. At present the company faces the future with only the I. H. C. pair, the Waterloo Boy having gone over to the Advance Implement Co.

While Slocum considers himself an implement man, and very recently as such was elected vice-president of the New York state association of implement dealers, his business, as a matter of fact, is overwhelmingly automotive. He sells Nash motor cars and trucks, Maxwell cars and International trucks in addition to tractors, and his attitude on the horse-drawn equipment has been noted. It's only habit that keeps him thinking along implement lines; he's actually an automotive dealer. His methods are automotive because he charges for service at the rate of \$1 an hour and after the first year expects to make a profit on his



"The House of Slocum," The Second and Slocum Co., Batavia, N. Y., is agent for the International and Titan tractors, Maxwell and Nash cars and Nash and International trucks, and is the leading firm of the city



This bright, attractive looking salesroom in Batavia, N. Y., is occupied by the Advance Implement Co. Dealers for the Moline Universal and the Waterloo Boy

tractor service, and he says the farmers don't kick. His opinion is that the implement dealer must get out of the free service habit or get out of the tractor business—one or the other.

The second biggest factor in the tractor trade here is R. M. Walker, the Ford and Fordson dealer. Walker claims to have sold more tractors this year out of Batavia than any other dealer, and probably that is so. At the present time his deliveries are limited only by the number of machines he can get and he snaps up Fordsons other dealers may have on hand unsold whenever he can find them. The day I was there he had located two at rather distant points and had sent his truck after them.

Walker has a wonderfully efficient shop and service organization, departmentizes his business, and recently he bought an entire brewery and is remodeling it into a warehouse which will be used largely for Fordson tractors and

the farm equipment he sells with them.

Walker says farmers like to see what other farmers have to say about the things the former are thinking of buying. So Walker gets testimonials from satisfied users of the Fordson, keeps these in a binder on his desk and uses them as a clinching argument in selling. This is only one of the many clever stunts Walker pulls and is merely one of the things which go to show why he is such an important factor in the tractor business of his town.

The Moline-Universal and, from now on, the Waterloo Boy, are sold by the Advance Implement Co. During the year just closing the concern sold three or four Molines and hopes to sell more next year, as also it hopes to sell a number of Waterloo Boys.

The concern sells implement and hardware and is not very aggressive in the



tractor business. Doubtless more could be accomplished if there were something which even resembled a service organization and if a little more selling effort were made. The manager, M. Hirsch, was away from home, hence I could not get his ideas for the future, but the impression one gets around the place is that the tractor end of the business needs a shot in the arm.

E. J. Salway, whose main business is flour and feed, sells implements and the Case tractor and is automotive in so far as he specializes on the Harley-Davidson motorcycle. Salway has some half dozen tractors out but maintains no tractor service department nor does he work the tractor trade at all aggressively.

Thomas L. Barber sells motor cars and Emerson-Brantingham implements, with special attention paid to threshing machinery. He has attempted to date to do very little with the tractor.

There is only one other retail implement business at Batavia and his business is largely on motor cars. He is not interested in the tractor business. Neither are two or three other motor car dealers as yet.

While the local tractor trade at present is dominated by one exclusive automotive dealer and by one implement deal-



We are a bit previous with this picture, for the story on conditions in Canandaigua, N. Y., where this building is occupied by Sisson, Fish & Brewer, will appear in next week's issue of Motor Age. The firm deals in Ford cars and Fordson tractors

Food Commission reported that up to the present time there had been 600 tractors of all makes sold in the state. As Thomas J. Northway, the Fordson distributor, has put more than 3000 Fordsons into the state within the last four-

laid down on the job or who could not establish the fact that he could make money selling tractors. The enforcement of this policy has cut the dealer organization down to a present force of sixty-six producing dealers, all but six of whom are automotive. The six are implement retailers.

In addition Northway has gone about selling tractors in a rational and intelligent manner which has some features better than the campaign of any other tractor distributor I ever have seen, and I have seen a lot of them all over the country. The methods Northway has used, if adopted by other tractor distributors, or applied to almost any other tractor than the Fordson, would have been equally productive. Knowing what these methods are it is easy to understand how Northway should have to his credit more than half of all the tractors in the state. What Northway has accomplished merely emphasizes what *MOTOR AGE* always has maintained that success in the tractor business follows rational and intelligent salesmanship.

Northway is a typical automotive dealer, with a completely departmentized business. The tractor department includes the farm implement department, and during the last year he has put sixty new and aggressive retail implement dealers into the field.

The Ford dealer here is the Sergeant Motor Co. A. W. Sergeant, of this concern, has organized a separate company, known as the A. W. Sergeant Co., Inc., which distributes the Beeman and the Moline-Universal tractors in eighteen counties in western New York. A special manager of the tractor department is employed and he is one of the busiest men in Rochester. The company is building up a nice business on the Moline machine, including a trade also on Moline power farm equipment, and is making as well an extraordinary success with the Beeman.



Again we are going to whet your appetite for next week by showing this picture of the DeWaters Bros.-Levy establishment in Elmira, N. Y., which has become automotive and sell the Avery tractor

er who is nevertheless overwhelmingly automotive, there is room here for at least two more aggressive dealers. The demand for tractors is growing in this vicinity and one or two more dealers who are up to date and on the go could make good selling tractors.

Rochester is too big a city to cut much figure as a retail center for tractors. Farmers buy their equipment in smaller places. For this reason tractor activities here are principally distributive.

The leading machines here are the Fordson and the Moline-Universal, although one or two others are represented. The curious anomaly exists here too of the Ford dealer distributing the Moline-Universal, while the Fordson is handled state wide by the Reo dealer.

Sometime ago the New York State

teen months the question as to how he did it is pertinent.

Well, Northway and his assistants have persistently and consistently talked power farming. It has been the policy to convince the farmer first that power farming methods were the best for him and then to sell him a Fordson tractor afterward as a means to that end.

This campaign was furthered by forty-one county demonstrations and by twenty-one competitive demonstrations and by a course of dealer co-operative stimulation which kept every Fordson dealer up and at work.

While the opportunity to sell the Fordson first is offered to the local Ford dealer, and originally some 130 of them undertook its sale, the Northway policy has been to eliminate every dealer who

# Garage Planning

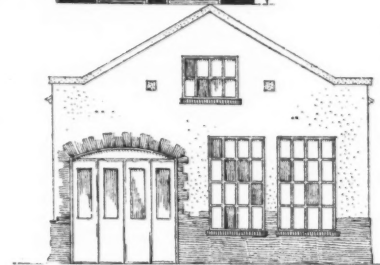
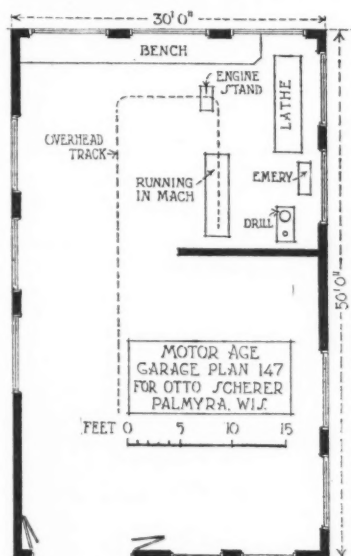
## Service Station Arrangements

### No. 147

#### GARAGE IN OLD CHURCH

Q—We recently purchased a church building 30 by 50 ft. that is in very good repairs and all in one open room. We are moving this to our lot adjoining the garage building 50 by 60 ft., which we are using at the present time.

This building had three floors and our intentions are to use this for automobile storage and farm tractors and the church building is to be used entirely for a work shop and we wish to arrange all of our machinery such as lathe, drill press, etc., to the best advantage in the room.



No. 147—Remodeling church to make a garage

We are also putting a basement under the church building which we can make very light by placing a chain of windows on the east and south and north sides. We have a west front where we enter from. Main street on the main floor and basement we enter at the north east corner.

Our intentions are to have a wash room and paint shop and balance for dead storage in the basement. The front of the church building we want to remodel as it is a story and a half building with one-third pitch roof.

The building is a frame structure, therefore can easily be remodeled and we thought of lathing it, then using stucco for the front with 10 ft. double door center entrance and a plate glass window on either side of the door. The second story we are planning on having three windows. —Otto E. Scherer & Son, Palmyra, Wis.

We are giving you a suggestion for your shop layout; you probably do not want anything on the basement.

MOTOR AGE is receiving many inquiries or garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of acres on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

We also show a front elevation which can be built by veneering your old church to a height of about 3 ft. with some nice face brick, a rough face preferred, and stuccoing the balance. The border around this door and the window sills should be built in place before the stucco is put on so that all will be bound together by it. Two 12-in. green terra cotta tiles inserted as indicated help give the front a little up-to-date pep.

The coping at the top of the gable is of concrete to shed water.

### No. 148

#### FOR STORAGE GARAGE

Q—We intend to build a storage garage in the near future, and we would like to have some suggestions as to the best arrangement and suggestions for a complete and up-to-date place.

We expect to have two floors in the building which covers four lots, totaling 100 by 125 ft. It is situated on the corner. A well-traveled street runs on the 125 ft. side; a residence street is on one end and an alley on the other. We wish to replace the elevator by using a ramp if possible. What is the steepest grade that would be practical for this class of place that could safely be employed?

We are considering a filling station on the corner, and an accessory room and office fronting in the filling station, and also in the garage if possible. We will want one or two wash racks.

We will be located in a hotel and apartment house district and will be able to fill the garage to capacity at all times. We thus want to employ all the conveniences that have been found to be practical and at the same time take advantage of all of the space for storage that we can.

We would appreciate any information and suggestions that that you can give us, coupled with any sketches.—E. G. Slack, Denver, Colo.

If your roof is trussed from the stock room partition back, the framing of the roof is much easier and all posts are avoided. Posts will not only interfere with the first floor, but will necessitate rearranging the supports in the basement. The front section of roof can just as well be carried on the partitions.

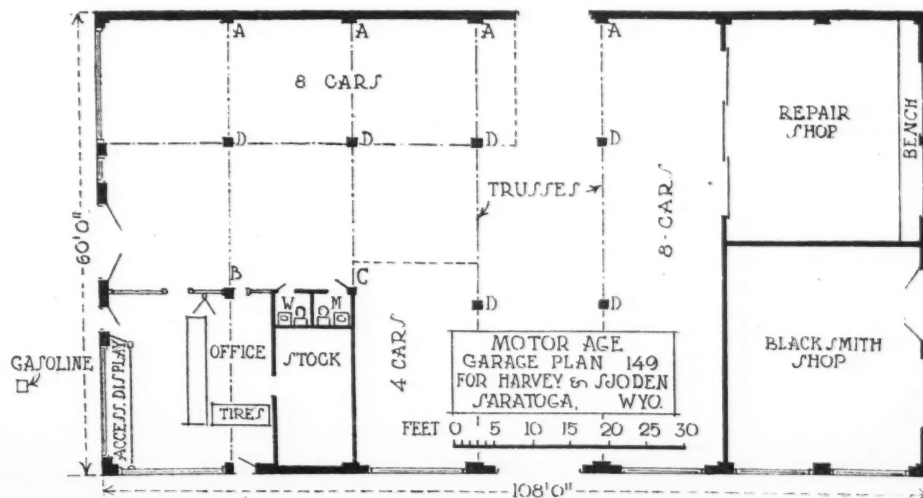
### No. 149

#### ASKS QUESTIONS ON CONSTRUCTION

Q—We are going to build a garage on a lot 60 by 108 ft. We want it to store as many cars as possible, a repair shop and blacksmith shop in the rear and office in the front parts big enough to hold some accessories and tires.

This will be a cement building with a flat roof. How heavy will the walls have to be to be strong enough to carry another story which we probably will build on later?

How do you mix the cement? That is, how many parts of gravel and how many cement? What company makes steel trusses?



No. 149—Plan for garage with storage capacity





## No. 151

## PLANS TO GET TRANSIENT TRADE

Q—I am figuring on building a garage on the Main street in Middletown, Conn., facing the City Park. The street is paved and close to 100 ft. wide. The traffic by this section is very heavy during the summer, as every one must pass by to get to the shore resorts on the sound and to reach New London and Boston.

Will say that I want to put up the building for \$15,000 and desire a fair size tire

and supply store, which later on could be turned into supply and show room, with an overhead balcony for the bookkeeping department, with several entrances into garage from store which should be within easy reach of women's and men's room, oil in drums, etc., near by, heated, wash stand and repair shop on left of main floor with rear entrance into it. What I want is an attractive front with gas pumps on curb, air and water also. Would you set building back or add stores in front?—Herbert F. Seif, Jr., Bridgeport, Conn.

We doubt very much whether you can

cover more than the 82 by 100 ft. section of your lot within your \$15,000 limit, and it may crowd you to do that, especially if building is as high in Connecticut as here.

For storage about the most economical width of space is 50 ft. That holds two rows of cars with an aisle between. Taking 50 ft. off, you have 30 ft. left for office, stock room, repair shop, etc.

We do not understand what you mean by adding stores in front, but if you mean to rent to other merchants we certainly would not do it. All the attention you can attract to your own business will be necessary to draw the transient trade that you are after. You will probably do very little repairing at first and it might be well instead of installing a large repair shop to use this space for storage until it is needed. Being 50 feet deep, it lends itself to storage nicely by turning an aisle into it as indicated by the dotted lines A.

## Continental Issues a New Engine

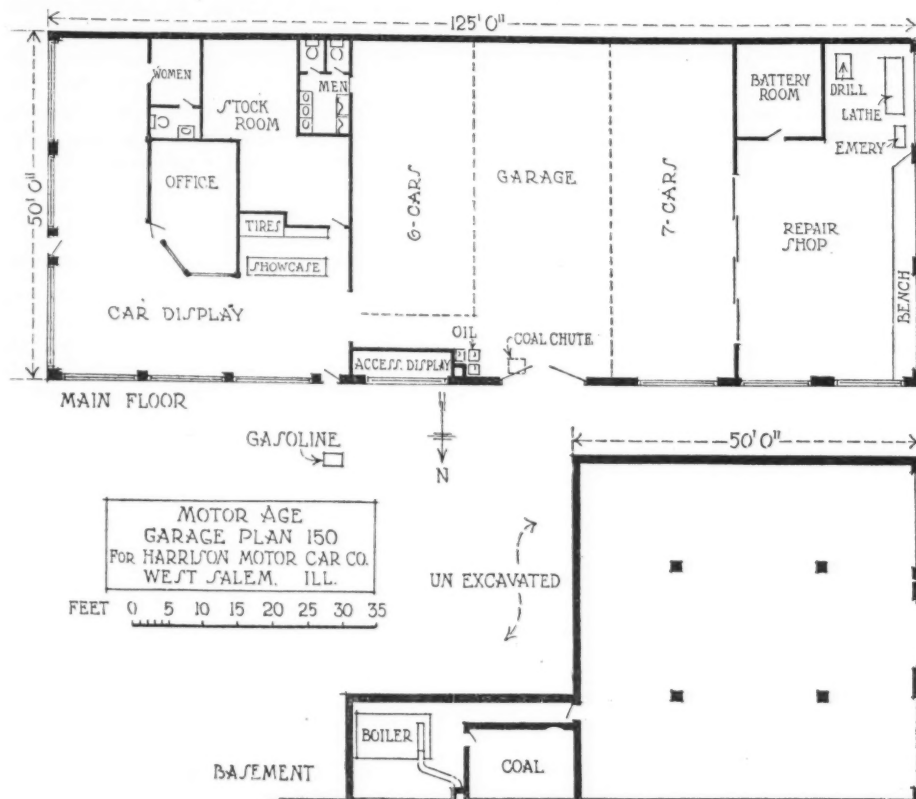
(Continued from page 32)

mounted on an adjustable bracket located on a boss at the front end of the cylinder casting.

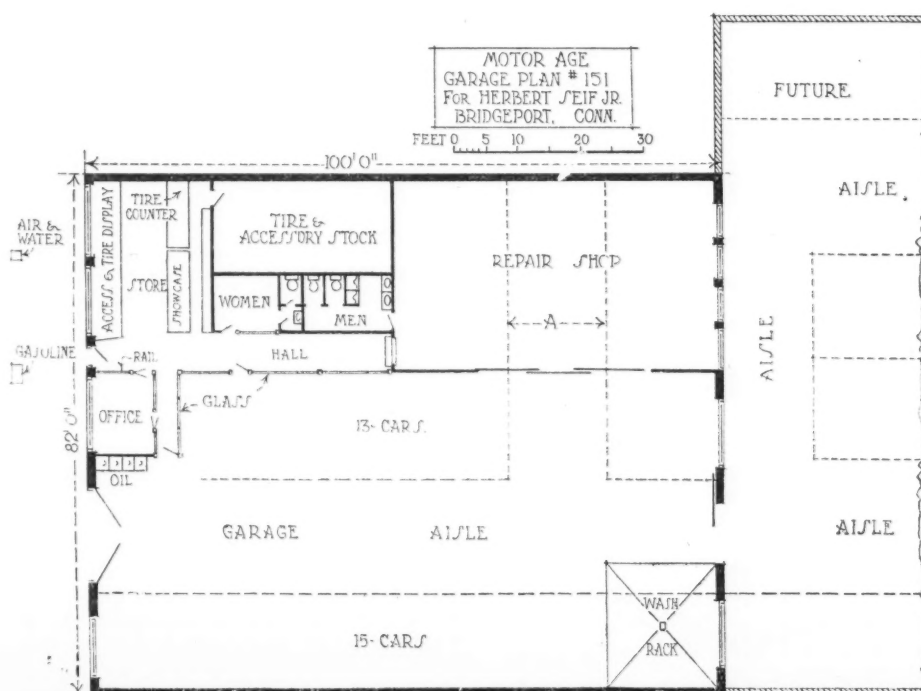
The lighting generator is attached to the left side of the engine looking at the flywheel end and necessitates special provision if the magneto is required in addition. The generator is driven by the water pump shaft and rotates clockwise, the method of attachment is S. A. E. standard, to a bracket cast integral with the crankcase. The starting motor is mounted on the right side of the engine and attached to the crankcase by means of the standard S. A. E. flange arrangement  $3\frac{1}{2}$  in. in diameter. Provision is also made for bolting a  $1\frac{1}{4}$  in. standard S. A. E. vertical type carbureter, and a starting crank attachment is furnished with the engine, complete, less a crank handle. A cable holder, however, will be provided as special equipment at extra charge.

From an accessibility standpoint, this engine has been very well thought out. For instance, the camshaft can be drawn out the front end of the engine, as the front camshaft bearing is  $2\frac{1}{8}$  in. diameter, this being the largest bearing size, and the second and third bearings are both large enough for the shaft to be drawn through. The adjustment of the valves, or the removal of the valve springs, is very simple by reason of the clear opening to the valve after the side cover plates are removed. The detachable head, of course, provides an accessible means of cleaning out carbon or reaching the valve head.

The exterior oil pump together with the internal lead provides an exceptionally accessible assembly for this unit, and the oil filler opening has been placed in such a position that it will not be covered by any parts of the chassis when mounted in a car.



No. 150—Show room at end of building with space to display about three cars



No. 151—Building plan with thought to get transient trade



# The Readers' Clearing House

## Questions and Answers

### TESTING VALVE SPRING TENSION

**Q**—Instruct how to test the valve spring tension on a Buick D-45?  
**2**—What clearance should cast iron pistons have, and what instrument do you measure the clearance with?—D. C. Slick, Granite City, Ill.

**1**—A simple scheme for testing valve spring tension will be found in Fig. 1. In fact, any device where the comparative tension of the springs can be measured will serve the purpose. The thing to remember is that each spring must be measured with exactly the same device or leverage. Almost any sort of scale can be employed, but a counter scale will be best adapted for the purpose, as this can be placed on a table or other flat surface and at a height that will not make bending over necessary. Have a flat piece of iron about  $\frac{1}{4}$  in. thick, 2 in. wide and a little longer than the width of the floor of the scale. Rig two rods, about  $\frac{1}{4}$  in., as shown at A in the figure; the other ends should be threaded. The flat iron crossbar should have a hole near each end to take these rods and another in the middle, perhaps  $\frac{3}{4}$  in. in diameter. A thumbnut can be utilized to advantage on the end that is to be operated to pull down the spring by the crossbar. Remember to hook the rods A under the base of the scale. Now, when you have placed the valve spring under the crossbar and have screwed down both the nut C and thumbnut D until the crossbar is level, and so it just touches the valve spring—inserted under the crossbar, as shown—you can put a small scale rule through the center hole in the crossbar down to the floor of the scale. You will note the reading on the rule at the surface of the crossbar. Then turn down the thumbnut—leaving the nut C alone—up to a certain point on the rule and note the reading in pounds on the scale. This will determine the relative strength of each spring. A weak spring can be stretched somewhat to do service.

**2**—It will depend upon the size of the piston. A fair rule for cast iron is to give a top clearance of .001 in. for each inch of bore and somewhat less clearance for the skirt. A caliper is used for such measurements, using it on the cylinder walls and again on the surface of the piston at both top and bottom.

### MOTOR FOR AIR PUMPS

**Q**—Would a  $\frac{1}{4}$  hp. electric motor, 1750 r.p.m., be a suitable size to connect up to a small air pump such as a Kellogg, for use around a private garage?

**2**—Would it be better to mesh the gears or use a chain?

**3**—What size of gears would be necessary?—B. R. Russell, Kokomo, Ind.

**1**—Yes.

**2**—Probably installation would be

Conducted by Roy E. Berg  
 (Motor Age Editorial Staff)

**T**HIS department is conducted to assist dealers, service stations, garagemen and their mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Motor Age reserves the right to answer the query by personal letter or through these columns.

### Engines

more simple with the chain, but it would make no material difference.

**3**—It will depend upon what speed you desire to drive the pump; it is a simple case of proportion. If your motor speed were 1750 r.p.m. and you wanted to drive the pump at say about a quarter that speed, it would require a driven sprocket with four times the number of teeth as that on the electric motor.

### TIMING VALVES

**Q**—Instruct how to time the valves on an Empire 31 engine. The chain that pulls the camshaft has come uncoupled and it seems to be a hard job to get it right again.

**1**—Just what position should the piston be in when the magneto points come together, as it has a set spark.—August Ivarsen, Balaton, Minn.

**1**—For the timing diagram of this engine refer to Fig. 4. The camshaft may be set in any desired position within the limits of one tooth, by having the camshaft drive chain brought to a position where the coupling link is exposed through the cover plate on the camshaft

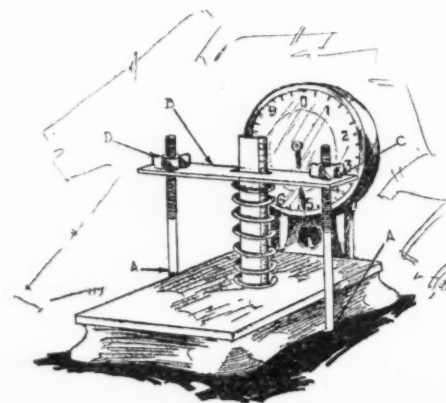


Fig. 1—Simple method for testing valve spring tension by means of a platform scale

sprocket housing and separating the chain at this coupling link. Then with thin sheets of metal, preferably soft tin, slipped under the chain and over the sprocket teeth, it will be found that the camshaft can be moved any desired amount, either forward or backward. One strip of tin only is necessary, this to be used on the top of the sprocket, as the chain on the bottom side will rest against the housing and the teeth of the chain will clear the teeth of the sprocket sufficiently so that it does not have to be held away from contact.

**2**—The magneto should be set so that the points will break about a  $\frac{1}{2}$  in. of flywheel travel after upper dead center. If the engine acts sluggish with this setting it would be save to advance it slightly to produce more activity.

### ASKS FOR POWER CURVES

**Q**—Publish power curve of Dodge engine.

**2**—Publish power curve of Overland, model 90 engine.—M. H. Decker, Miami, Ariz.

**1**—See Fig. 3.

**2**—See Fig. 2.

### NASH HAS PICK-UP TROUBLE

**Q**—A Nash 6, model 681 5-passenger touring car has been run about 5000 miles. The valves have just been ground. It ran very good for the first 100 miles, but now it will not run over 30 m.p.h. without backfiring and will not run much over 35 m.p.h. It runs very well when running about 10 to 15 m.p.h., but under five it misses. The hotter the engine gets the sooner it will backfire when accelerating. One piston leaks a little oil. New rings have been installed. The rest of the cylinders have good compression.

**2**—What speed can be obtained in a Nash 6 when everything is in good condition?—Harold King, Hope, Ark.

**1**—This trouble would appear to be a combination affair; that is, one thing is to blame for the poor running above 30 m.p.h. with a different cause for backfiring. So far as missing at speeds under 5 m.p.h., it appears to be an air leak at some spot—the carburetor flange, the plugs, worn valve stem guides or badly fitted manifold gaskets. These should all be gone over carefully to know that no air is being taken in at any of the places named. A test can be made when the engine is running by squirting a little light oil around the joints and watching closely to see if any is drawn in.

The backfiring may come from weak valve springs or warped or fouled valve stems. Good compression would not show this defect. If the valve stems are warped they should be straightened; if there is an air leak caused by wear in the guides, they will have to be bushed or reamed out and oversize valve stems inserted. Sometimes carbon will accumulate on the stems and work its way

down even past the edge of the guides, particularly where the guides are worn to permit this. A temporary remedy is to clean off the stems and to undercut them a hair in order to provide a recess for the carbon to accumulate and still not cause a binding of the stem against the guides. The fact that the backfiring increases as the engine heats is evidence that the valves do not close, either becoming stuck or not seating because of weak springs.

2—A good average speed for this car is 55 m.p.h. and if tuned up and put in the best condition it can be brought up to very close to 60 m.p.h.

#### TIMING MULTI-CYLINDER ENGINES

Q—Explain how to time eight and twelve cylinder engines?—Elliot Mease, Tyrone, Penna.

In calling for timing of engines, readers too often fail to state whether it is valve or ignition timing that is desired and it is impossible to determine what is desired. Taking the chance that it is ignition timing, the rule is to bring, say, No. 1 cylinder to the top dead center on the compression stroke, fully retard the spark lever and then set the breaker so it is just beginning to open at this point. Naturally enough, this will time all the cylinders automatically. If it is valve timing, it will be necessary to know the make and model of engine to give the correct timing, although as a rule, the flywheel is marked so it is difficult to go astray.

#### WATER LEAK IN CYLINDERS

Q—A 1916 Dodge that has been run 20,000 miles is giving the following trouble: The two rear cylinders, No. 3 and No. 4, flood with gas. The spark is good and new rings have been put in both cylinders. Valves are new, as well as the spark plugs. Carbon has been removed and everything clean. No. 1 and No. 2 works good. No. 3 and No. 4 floods with gas even with no water in radiator. With radiator the trouble of flowing is still worse. No scores, good compression in all cylinders. The car has been giving trouble for two seasons.

2—Have recently returned from a trip to Kentucky and in traveling through the state of Illinois in mud with practically all the distance from Shelbyville to East St. Louis in second gear, driving a Briscoe car. What would be likely to need attention, due to wear and excessive second gear work? Also in going up very steep hills, engine would stop and stick and make it necessary to get out and use

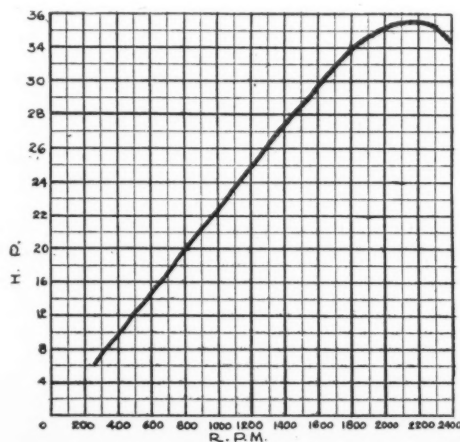


Fig. 2—Horsepower curve of Overland Model 90

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

#### ENGINES

D. C. Slick.....Granite City, Ill.  
August Ivarsen.....Balaton, Minn.  
B. R. Russell.....Kokomo, Ind.  
M. H. Decker.....Miami, Ariz.  
Harold King.....Hope, Ark.  
Elliot Mease.....Tyrone, Pa.  
W. M. Pate.....Hoberg, Mo.  
A. Reader.....Eufaula, Ala.  
A. E. Tischart.....Chicago  
Neil C. Ensworth.....Ishavooa, Wyo.  
W. N. Grich, Reliable Auto Repair Co.....Mexico, Mo.  
E. Sizer.....Tacoma, Wash.  
R. L. Frick.....Anna, Ill.

#### THE ELECTRIC SYSTEM

D. C. Slick.....Granite City, Ill.  
C. B. Jones.....Baker Corner, Ind.  
T. H. Woolway.....New Castle, Pa.  
Riverside Garage.....Port Francis, Ont.  
Otto B. Swenson.....Claremont, S. Dak.  
B. L. Hailles.....Pittsburgh, Pa.  
Buckmaster's Garage.....Blissfield, O.  
D. W. Greye, Davis Garage.....Heshkoro, Wis.  
Arvid K. Audern.....Instanter, Pa.  
Lloyd Watters.....Neillsville, Wis.

#### MISCELLANEOUS

F. W. Kehrler.....Bucyrus, Ohio  
Edward L. Morgan.....Bisbee, Ariz.  
A. E. Tischart.....Chicago  
T. A. Davis.....McKeesport, Pa.  
W. A. Robinson.....Iowa City, Iowa  
Buckmaster's Garage.....Blissfield, Ohio  
M. H. Decker.....Miami, Ariz.  
Buckmaster's Garage.....Blissfield, Ohio  
W. A. Robinson.....Iowa City, Iowa  
O. Livingston.....St. Louis, Mo.  
James F. Mulcohy.....Henry, Ill.  
N. H. Hormel.....Oakdale, Pa.  
W. N. Vincent.....Lexington, Miss.  
Estel Dickerson.....Sherman, Ill.  
N. H. Hormel.....Oakdale, Pa.  
Henry Fink.....Buckeye Lake, Ohio  
Ray Frates.....Brule, Neb.

#### REBUILDING

W. N. Grich, Reliable Auto Repair Co.....Mexico, Mo.

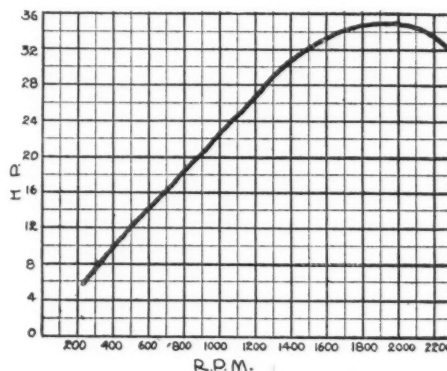


Fig. 3—Horsepower curve of Dodge engine

the crank to start and engine would be hard to spin, due to being stuck. What would cause this sticking on steep hills?—W. M. Pate, Hoberg, Mo.

1—Sounds suspiciously like a water leak into the two back cylinders; yet this could not develop when there is no water in the system. It cannot be what you term as "flooding," for with any such excess of gasoline the engine would not run at all on these two cylinders. There may be an excess of fuel and more or less of a residue owing to the possible fact that the ignition is at fault and the gas is not completely burned. It is suggested that you look first to the gap in the spark plugs, then trace the wiring through to the timer to be sure connections and contacts are complete. Cut-

ting down the supply of fuel at the carburetor may also have some effect. Possibly you are running with the choke not properly adjusted.

2—Lack of either lubrication or water or both would tend to overheat the engine bearings and make them expand until they at least almost seized. If the engine was new or the bearings had been tightened up before you made this drive, naturally this would be severe work for an engine in such condition. If there were ample lubrication, if the bearings had been sufficiently run in and there were plenty of water, second gear work should not cause the trouble mentioned; it might cause the water to boil slightly, but this would not be harmful unless kept up for a long period.

#### COMPRESSION IS TOO HIGH

Q—In a Abbott Detroit car, model B, I noticed that the cylinder heads have been raised by placing a 3/4-in. iron gasket underneath. Explain the advantage of lowering the compression, or was the gasket put in at the factory?

2—Would you advise taking them out? Believe they were put in for experimental purposes?—A. E. Tischart, Chicago.

1—It may have been found that there was too high compression to meet the particular needs of some owner and the plates were interposed to reduce this. It would make for a slower running engine and would reduce the power. Yet, it is almost inconceivable that the cylinders should be raised 3/4 in.

2—Before removing the gaskets, ascertain the amount of compression and then you can determine whether they should be removed or not. It would hardly be advisable to have the compression under 60 lbs. and with this type of engine it should not go above 80 lbs.

#### DRAINING CYLINDER JACKETS

Q—A Model 75 Overland does not drain properly in the cylinder block. The block is built so that when the car is drained on the level about 1/2 in. of water remains in the jacket as the outlet is that much higher than the bottom of the jacket. Consequently it froze and now leaks into the crankcase, thus diluting the oil. Have you ever heard of this trouble before? What do you think of filling the jacket

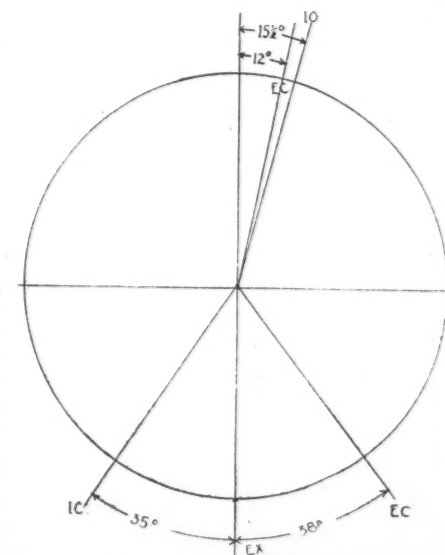


Fig. 4—Valve timing diagram on Empire 31 made in 1915





ready for use? Such a device is made by the Knight Metal Products Co., Detroit.

2—This is shown in Fig. 7.

### QUERIES ON GENERATOR

Q—Publish internal wiring diagram of North East starter generator as used on the 1918 Dodge car. This generator has four fields and only three brushes. Are the shunt and series windings connected? This generator did not charge, upon examination found the wire leading to the third or lower brush burnt and disconnected. After repairing this and truing up the commutator and undercutting the mica it still refused to charge, but when one of the brushes was lifted from the commutator there would be much sparking and a hard pull for the engine, almost enough to start it? What could be the trouble?—Garrett Bouma, Pease, Minn.

There is a possibility that if the wire leading to the third brush was burnt then the fuse protecting this field was also burnt out. This fuse which you will note in the illustration, Fig. 9, you no doubt renewed, because this is one of the first places to look for trouble. The illustration is unusually complete and shows all the windings both in the starter generator and the reverse current cut-out. Check up all the windings with those in the illustration. The facts as you state them point out that the motor winding are complete, but the generator windings must have an open circuit somewhere. Just where we can not say because there are so many possibilities.

### KNIGHT WIRING DIAGRAM

Q—Publish wiring diagram of Model K Lyons Knight car.—C. B. Jones, Bakers Corner, Ind.

This is shown in Fig. 6.

### PATHFINDER WIRING DIAGRAM

Q—Publish wiring diagram of Pathfinder Model 2B Twin Six.—T. H. Woolway, New Castle, Pa.

This diagram is shown in Fig. 5.

### STORING STORAGE BATTERIES

Q—Give the best method of dry storing storage batteries for winter.

2—What specific gravity should electrolyte be when put on battery on assembling in spring.—Riverside Garage, Fort Frances, Ont.

1—By all means place it where it can be kept moderately warm and also kept on charge now and then, otherwise it may be ruined. If not charged the electrolyte will freeze and this may break a jar. If the battery is kept charged fully it will not freeze in reasonably cold temperature. If the specific gravity is permitted to get down to 1.150 and the battery is discharged it will freeze at 13 deg. above.

2—Keep the battery charged, as told; it should never be permitted to get under 1.225 if possible.

### TIGHTENING GENERATOR CHAIN

Q—Instruct how to tighten generator chain.—Otto B. Swenson, Claremont, So. Dak.

As a rule it is necessary to move the generator slightly so as to bring the chain taut; that is, leaving just a little "give" in it. If there is no idler to take up the slack then this is the only means. An exception may be suggested where the chain generator is directly above the

driving sprocket and in this case the generator may be shimmed up slightly. Where it is necessary to move the generator it may also be necessary to file out the bolt holes so as to permit it being moved, but in this case care must be used to see that the generator is lined up properly.

### POOR CONNECTION CAUSES TROUBLE

Q—A Buick 25, 1914, run fine for about 2 miles, and after letting it stand about 2 hrs. a loud knock, which sounded like a loose rod, occurred when it was started again. After a short time car stopped and it could not be started with starter. Found the ground wire from battery very hot. I loosened the wire, thinking there was a short circuit, and went over all wires but could find nothing wrong, so I tightened the ground wire again but it did not get hot. The car started and ran all right with no more heating of ground wire. What is wrong and give remedy.—Buckmaster's Garage, Blissfield, Ohio.

Just what caused the engine to stop we cannot tell, but the heated wire was due to a poor connection that permitted only a part of the heavy current to find

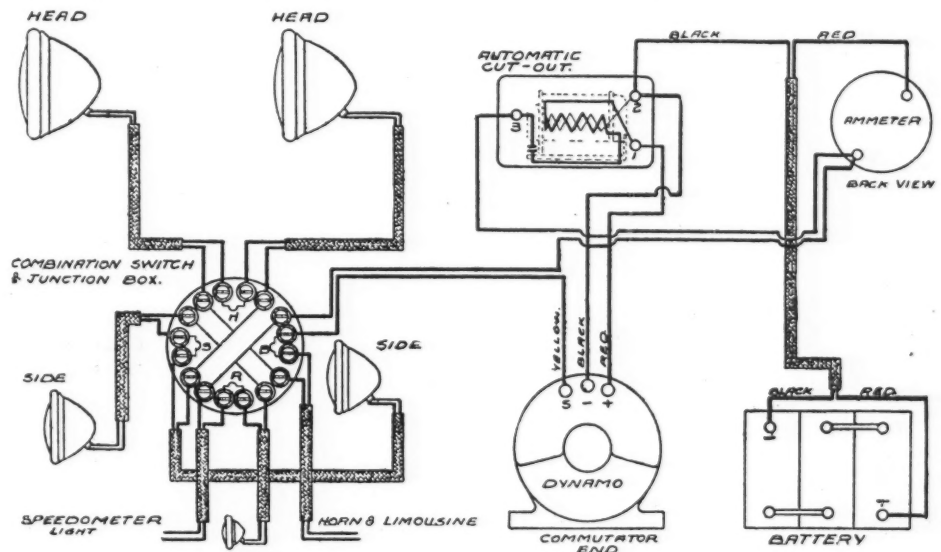
its way out. This is shown by the fact that the heating disappeared when the connection was tightened. This is also the cause of the starter not working, the current passing being insufficient to operate the starting motor. Possibly the engine stopped because the starter gears became meshed with the flywheel gears.

### NEW BULBS NEEDED

Q—When a Ford is new the magneto is very strong and gives a good light, but as they get older the light gets weaker; also the firing gets weaker. Is there any way to adjust the Ford magneto to improve the strength of it?

2—If the battery is taken out of a 1920 Ford equipped with starter and lights, is there any danger of hurting the generator if car is "un"? How would you change the wiring?—D. W. Freye, Davis Garage, Neshkoro, Wis.

1—Your remedy will probably be in putting in new bulbs, for these little articles deteriorate in time and with use. And the coil vibrators should be readjusted. At the same time see that the platinum points are clean, and filed down so they are even. Otherwise it means new magnets, recharging the old ones



GRAY & DAVIS SYSTEM FOR 1913 REO

Fig. 7

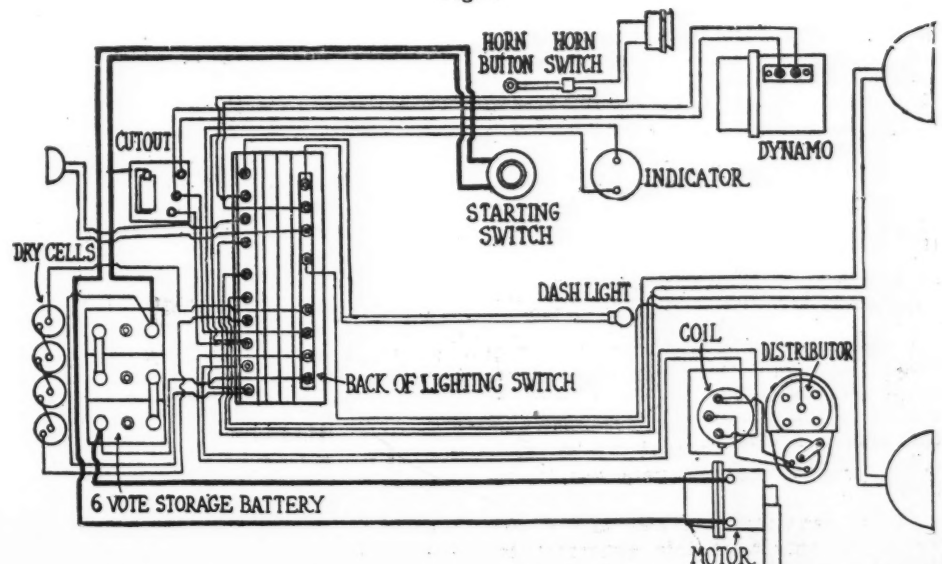


Fig. 8—Diagram of connections on 1915 Studebaker using Wagner starting and lighting with Remy ignition



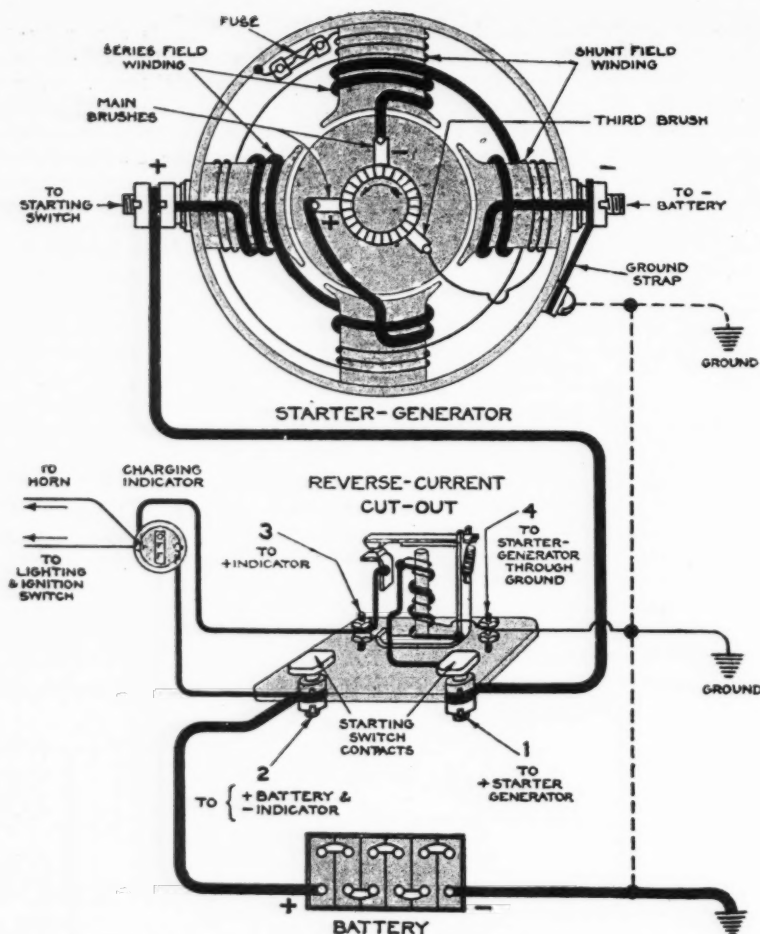


Fig. 9—Internal connections of Northeast generator used on 1918 Dodge car

or putting in a new third crankshaft bearing so the gap between the magnets and pole pieces will be 1/32 in. only.

2—You will ruin the generator if you attempt to run it with the battery out or disconnected, for the current generated must go somewhere and will back up and burn out the armature. Connect a heavy insulated wire from the binding post on the generator to one of the valve cover nuts, being very sure the connection at either end is good. The wire must have a diameter of better than 1/16 in.

#### WIRING DIAGRAM OF STUDEBAKER

Q—Publish wiring diagram of 1914 Studebaker Touring car, model 4.—Arvid K. Audernn, Instanter, Elk Co., Pa.

This is shown in Fig. 8.

#### OUTPUT OF GENERATOR

Q—What would be the electrical output of the Esterline generator as used on the 1913 Mitchell when run at 1800 r.p.m.?

2—Publish wiring diagram that may be used for a stationary lighting system from the Esterline generator. Give size of light bulbs?—Lloyd Watters, Neillsville, Wis.

1—This is a 6-volt system and the output at that engine speed will be about 25 amp. This is the maximum output of the generator and more than this should not be taken from the machine for the coils are very apt to be burnt out.

2—The generator is shown in Fig. 10. Since the output of this generator is limited to about 25 amperes and 6 volts it will not be possible to consume more

than 150 watts constantly. This is, the sum of the rated capacities of the lamps connected to the circuit should not exceed 150.

## Miscellaneous

### OUT-OF-DATE TIRE SIZE

Q—Where can I obtain a smooth tread tire. Clincher of Q. D., with 38 x 4 1/2 casing?—F. W. Kehrer, Bucyrus, Ohio.

This is an out-of-date size and so far as known nobody is making it now. It was used on the old American underslung car. It is possible some dealer will have some old stock of this size. Try the Serlin Tire Co., Michigan Ave. and Thirteenth St., Chicago. In the long run, it will pay you to change the rim sizes so you can use stock tires, otherwise you will have trouble being fitted out, and in the country it would be impossible to secure such a size.

### PROTECTING NEW TIRES

Q—Is it feasible to cover a standard make smooth tread tire with a half sole immediately upon its purchase?

2—If this method is practical, why has it not been used before to any extent? It appears to me that tires built in this manner would be absolutely blow out and puncture proof, and more free from stone bruises.

3—Would tire be too heavy and increase gasoline consumption?

4—Would fabric and rubber in the under casing become separated after one or more half soles were used if proper inflation was kept generally?—Edward L. Morgan, Bisbee, Ariz.

1—It is probably feasible enough, but hardly necessary until the casings have shown some wear. If this were a good plan it is probable tire makers would manufacture tires double the thickness now used.

2—Probably you are right, yet there is the disadvantage of having the extra thickness and the extra cost before it would seem to be necessary.

3—The extra weight would undoubtedly have some effect on gasoline consumption in that it is adding to the unsprung weight of the car. It will also slightly increase the gear ratio and call for a little more work on the part of the engine in heavy going or in hill climbing.

4—Separation of fabric is generally caused by water getting between the layers or the friction generated through the plies chaffing, both caused by under-inflation. A tire that kept up to proper inflation should not readily give trouble in this direction. Care must be taken that water does not get between the casing and the half sole; likewise, sand should be kept out, otherwise it will grind both sides into shreds. The time to use a half sole is when the casing tread has become fairly well worn.

### OVERSIZE TIRES

Q—Will 36 x 4 1/2-in. tires fit 34 x 3 1/2-in. rim? A. E. Tischart, Chicago.

No, the oversize for 34 by 3 1/2 in. rims would be 35 by 4 in., but it is doubtful if such a size can be obtained. It is suggested that it will be far better to have new rims put on that will take a standard size tire, for in the long run this will prove much better in that you will be able to procure tires anywhere in the country. Have rims put on for a 34 by 4 in. tire and then you can use 35 by 5 in. for oversize.

### RUNNING TRACTOR WITH NATURAL GAS

Q—What is the bore and stroke of an Allen model 34 M?

2—Is it possible to run a Cleveland tractor 1917 model as a stationary engine, using natural gas as a fuel? If so, what changes are necessary?—T. A. Davis, McKeesport, Pa.

1—The bore and stroke of this engine is 3.625 by 5 in.

2—You can burn natural gas successfully in your engine, but the results will not be the very best if the compression pressure is left the same. The compression pressure in your engine is about 60 lbs. per sq. in. The most efficient operation for a gas engine of this size using natural gas is obtained with a compression pressure of 70 lbs. The only effect this will have on your engine will be to decrease the output slightly.

Some change will probably have to be made in the mixing system. That is the carburetor will have to have the air proportions cut down to approximately half of what is necessary for the proper combustion of gasoline.

### ASKS ADVICE ON OILS

Q—Is Mobile oil too heavy an oil to use in an Oakland Six 24-B in winter?—W. A. Robinson, Iowa City, Iowa.

Any good oil of light grade will do; if you cannot procure the light grade, then you are safe with the medium grade unless your engine is very tight all through. But there is one precaution all motorists should observe and that is to let the engine warm thoroughly before starting out into the cold. Throw a blanket or radiator cover over the radiator and permit the engine to idle until the radiator has become well warmed. By this time the metal parts all through the engine will have warmed and the oil will also be in a condition to circulate freely. If you were to start out with the engine cold, and the oil more or less stiff, the oil would not find its way to the bearings and damage might result. It is also well to put lubricating oil in the differential to mix with the grease.

### LOOSE SPOKES CAUSE NOISE

Q—A Buick B 25, 1914, has a loud squeak in the rear end at tires on both sides of car. It sounds as if it was in the wheels or thereabouts. This squeak occurs mostly on muddy roads, or when car swerves sideways and always when turning curves. The wheel bearings have plenty of grease, also differential, all bolts and stay rods are tight and brakes have just been relined.—Buckmaster's Garage, Blissfield, Ohio.

There is a probability the trouble lies in loose spokes, due to the age of the car. This will show most under side thrusts, which will naturally come when driving in a rough road where the car is pitched from one side to the other. Remove the wheels and tighten up the nuts on the bolts that hold the brake drum and outer flange together. Then soak up well with water and see if this does not eliminate the troublesome noise.

### SLIPPING OUT OF GEAR

Q—When running in second speed an Overland, model 90, slips out of gear into neutral, unless the shift lever is held firmly in place. Instruct how to remedy this.—M. H. Decker, Miami, Ariz.

Indications point to a worn second gear on the gear countershaft. If it were the high gear causing trouble it would mean a new shifting arm and new engaging dog and spring, but where the second gear jumps it is usually due to this being worn slightly beveled, so that nothing will hold it in place. It means a new gear. Probably you have been doing a good deal of second gear work, which will account for the excessive wear.

### NOISE IN OLD GEARS

Q—Instruct how to remove a loud noise from the transmission and rear end gears on a Buick B 25, 1914. They grind at all speeds, with a very bad slap which sounds as if it were in the coupling between the clutch and transmission. This occurs when car is driven at 25 m.p.h. Car has a new driveshaft, new drive gear is tight on the case and all gears are good except ring gear, which is pinion and new pinion bearing, the ring slightly chipped on edges of teeth. Have tried every adjustment. The transmission has all new bearings and bushings.—Buckmaster's Garage, Blissfield, Ohio.

Naturally enough, old gears will make more or less noise due to wear and misalignment caused by the wear in the bearings carrying the various parts. The real remedy will be new gears and new bearings, but perhaps renewal of the

bearings alone will tend to somewhat lessen the grinding noise.

The so-called slap is due to worn parts all through, causing backlash. It requires only a little wear in the universals, drive shaft ends, gears, differential gears, pinion and ring gear and cross shafts to make a considerable play and consequently backlash. This can be taken up only by adjusting the gears as far as possible so they mesh correctly, putting in new parts where there is apparent play. Every engine reaches what is called a critical point at some speed and it is usually around 25 m.p.h. This is really when the engine is slightly out of balance and is not running evenly, so that the hesitance on the part of the engine in its smooth operation will cause a slight backlash. This might also be due to your timer being in such condition as to permit the engine to miss slightly at the speed mentioned. This point many times causes trouble and is frequently overlooked.

### TESTING NON-FREEZE MIXTURE

Q—Is there an instrument to test the proportion of alcohol and water in the radiator, or how is it determined?—W. A. Robinson, Iowa City, Iowa.

There is, what is known as a freezeometer, which means a meter for telling the freezing point of an alcohol-water solution. This may not tell the exact proportion, but as it will tell the freezing point the proportion can be determined from this. Such an instrument is made by the Taylor Instrument Co., Rochester, N. Y., or Heyworth building, Chicago. Before the war it cost from \$1.50 to \$2 depending upon the nature of the case. Try the Alcohol Lamp and Stove Co., Davenport, Ia., which used to handle this instrument.

### DIFFERENTIAL ADJUSTMENTS

Q—Illustrate and give adjustment of differential on an Oakland 6 34 B.—O. Livingston, St. Louis, Mo.

There is but one adjustment on this axle. This is illustrated in Fig. — Any

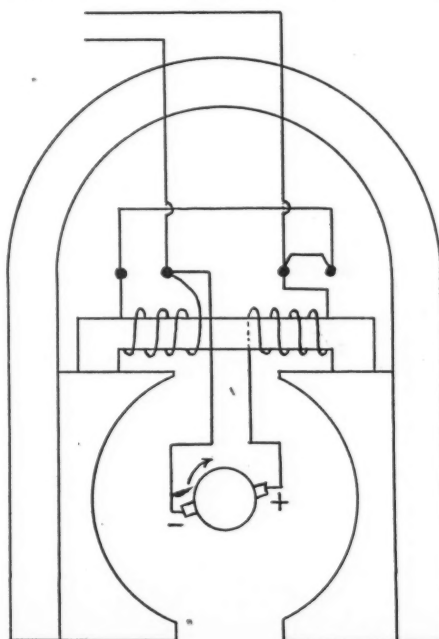


Fig. 10—Internal connections of Esterline generator used on 1913 Mitchell-Lewis

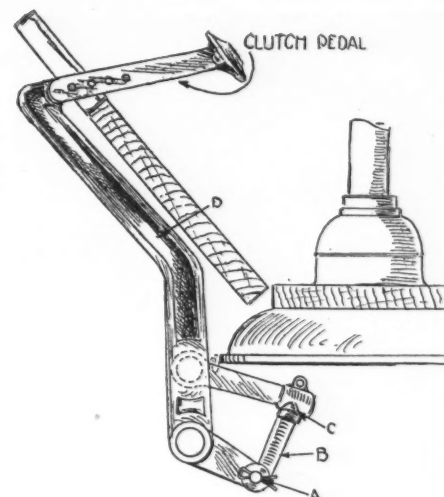


Fig. 11—Positions for adjustment on Oakland 48 clutch

excess play between the driving gears is removed by making the necessary adjustment on the pinion shaft which is mounted in a sleeve so that the small driving pinion can be moved in or out to get the proper clearance between the gears. Turning the adjustment collar at the front end of the pinion shaft to the right moves the shaft and gear in toward the large drive gear and decreases the clearance between the gears. The adjustment collar is held in place by a locking device which must be removed before any change in the relative position of the gears can be effected.

### OAKLAND CLUTCH ADJUSTMENT

Q—Instruct how to adjust the clutch on an Oakland 48.—James F. Mulcohy, Henry, Ill.

In all probability your clutch does not need adjustment. If it is slipping clean it with kerosene to cut all the grease and oil, then give it a washing with gasoline. Let the gasoline dry off pretty well and apply, evenly, neatsfoot oil, permitting this to remain over night to soak in. This will soften the leather and thereby raise the fibre. If the clutch grabs, put new springs under the face to raise the leather and permit easy engagement. The only adjustment is in the clutch pedal linkage, to take up slack or relieve binding against the floor board. If there is too much slack the clutch may not disengage as far as it should; if it is binding against the floor board this will hold the clutch out of engagement a little, enough to permit the clutch to slip. To make this adjustment consult Fig. 11. You will notice if there is too much play at D between the floor board and the clutch pedal. There should not be more than 1-8 or 3-16 in. To adjust, remove the cotterpin A and slip out the screw stud B. This can be turned to the left to tighten the adjustment and to the right to loosen. The pivot B engages the throwout arm that operates the clutch collar inside the housing. You will have to make several trials to get it where you want it. Then slip the pin on the end of B into the link and replace the cotterpin.



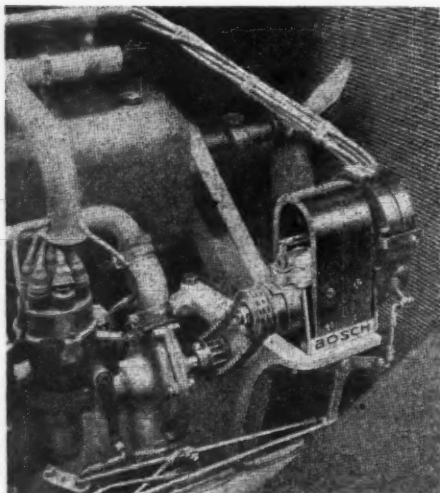


Fig. 12—Showing the installation of a Bosch magneto on an Oakland 48

### STEAM CAR QUERIES

Q—Did the Locomobile manufacture a steam power plant for motor cars?

2—Show illustration of engine, if Locomobile made one.

3—What percentage of water is returned to the boiler through the condensation of the exhaust steam in the present day steam motor cars?

4—Could the power plant of the Stanley motor car be used in a farm tractor?

5—Would the boiler produce steam fast enough for the requirements of the tractor?

6—Are there any steam tractors under development using the flash or semi-flash or fire tube boiler?—N. H. Hormel, Oakdale, Pa.

1—Yes, in the late 90's, later turning to internal combustion engines for power.

2—This is shown in Fig. 14.

3—This is hardly to be measured by percentage, for there are so many conditions governing, such as road, capability of driver, etc. About 25 m.p.h. is considered the most efficient speed for a Stanley steamer and the engine is rated 20 hp. with a boiler pressure of 500 lbs. per sq. in. The water supply capacity is 20 gal. so that this would be exhausted in 200 miles or about 8 hrs. Some Stanley drivers claim to have far better results in the conservation of water, the claims running as high as 800 miles to 20 gal.

4—Yes, and it has, but to what extent we are not informed.

5—This would depend upon the size of the tractor and the extent of the work it is called upon to do. With a light tractor doing comparatively light work, yes; while greater steam capacity could be procured, if needed, by having two boilers. In all probability the single boiler would suffice because of the fact that the tractor would be at greatly reduced speed and with an engine developing full 20 hp. this would be sufficient to do heavy work.

6—None, that we know of.

### CAR USES TOO MUCH OIL

Q—A 1919 six-cylinder Oldsmobile, model 37, with Northway engine, uses oil to such an extent that little service can be obtained from the car. The engine is equipped with Lynite pistons. New ones were put in by the factory but did little toward eliminating the trouble. Is it possible to caliper the cylinder walls and

have cast pistons made for same? Will this affect the running of the car and would the pistons have to be made of a certain weight?—W. M. Vincent, Lexington, Miss.

With due respect to the factory installation we still believe that there is ample opportunity to cut down on this oil consumption and plug fouling by careful fittings of the pistons. To do this you will need to make some careful measurements on the engine. First use an inside caliper and measure the bore of the cylinders. This should not be done in one position only. Do not be satisfied until you have taken a great many measurements on the cylinder bore. Start at the top. Take say four readings at this position. Measure the diameter in a sideways direction and then a fore and aft position. Also take readings at points equidistant between these points. This is the only way to make absolutely sure that the cylinder is round. This operation should be repeated at the lower position of the piston and also at points between these extremes. If the cylinder is round at these various positions, and the measurements

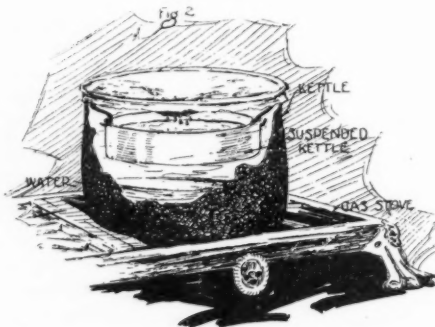


Fig. 13—Supplementing the still idea described and illustrated in last week's issue of Motor Age

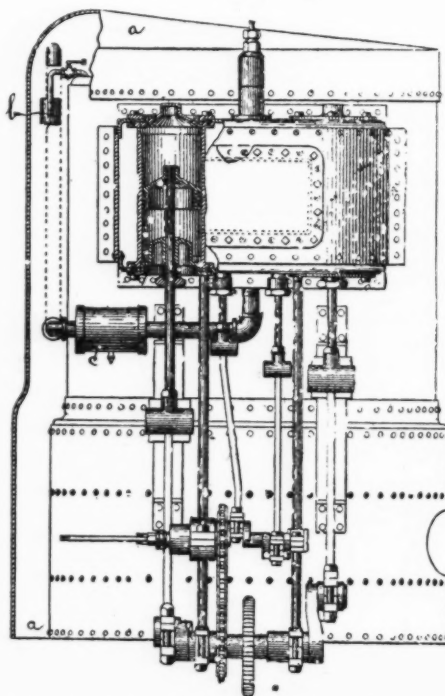


Fig. 14—Cross-sectional view of steam engine used in the old Locomobile type of power plant

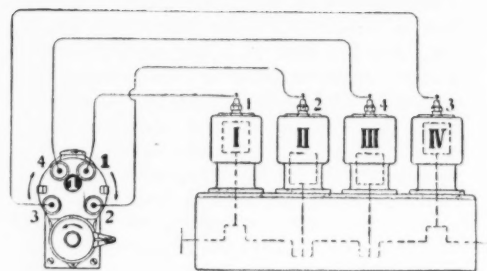


Fig. 15—Wiring diagram of Bosch magneto on Oakland 48

do not vary more than 0.001 in. then you can proceed with the piston fitting.

It is not necessary to discard the aluminum piston idea, but we do think that your particular piston will have to be replaced with new ones. The fitting of these pistons should be done carefully. Machine the piston so these clearances will be maintained:

At upper ring land 0.024 in.

At center ring land 0.014 in.

At lower ring land 0.008 in.

At skirt, 0.0035 in.

If the pistons are accurately cut to these measurements then it will not be necessary to lap the pistons in. This of course implies that the cylinders are also accurate.

As an example of what these measurements should be, we will assume that the cylinders measure 2.8750 in., which they should do for your car. Then cut the skirt of the piston so that its diameter will be 2.8615 in.

### INSTALLING BOSCH MAGNETO

Q—Instruct how to install a Bosch magneto on an Oakland 48, 1914, in place of Delco system.—J. D. Keiser, Marion, Ohio.

The Bosch company will be able to furnish you with a bracket to carry the magneto, also the necessary and correctly-sized sprockets so the magneto may be driven by the timing shaft, which is the correct speed for the magneto. In a four the magneto will travel at camshaft speed. In Fig. 12 will give a good idea of the installation and Fig. 15 will show how to connect the wiring. You will have to state, in ordering, whether you need a clockwise or anti-clockwise magneto. In addition to the wiring shown, it will be necessary to run a wire from the terminal on the breaker box to a switch located at some convenient place and from the other side of the switch to some portion of the frame of the car, so the current can be grounded and thus make the magneto inoperative. This is the manner in which the engine is stopped—to ground the primary current and to have the switch open when it is desired to run the engine.

### CLEANING RADIATORS

Q—Instruct how to clean out a radiator and cooling system which has become clogged with radiator compound. There were a few small leaks in the radiator and some "Sementol" was put in. It was cleaned out well the first time, but when more was put in it, as the first did not prevent the leak for any length of time, the radiator became

clogged so badly that the engine overheated very easily. The radiator is of the honeycomb type.—Estel Dickerson, Sherman, Ill.

Make a mixture of about 3 gal. of ordinary washing soda, using about 2 lbs. to this quantity of water. Use hot water and stir in an earthen jar or wooden pail. When the soda has become dissolved, strain and pour into the radiator of the car, first having drawn off the greater part of the water in the system. Be sure the soda solution does not touch paint or clothing, else either will be ruined. Then fill up with enough water. Run the car a day or two and drain off; then fill with clear water and drain again. Fill with clear water and use the car another day and after draining and filling once more the system will be cleaned. But you will probably now have a leaky radiator and this should be fixed by a radiator man.

#### COAL FOR MOTOR CAR FUEL

Oakdale, Pa.—Editor Motor Age—In view of the diminishing supply of oil and gasoline, why have not the engineers turned their attention to the possibilities of coal as a means of motor car propulsion. The public is aware of the energy stored in coal dust. Some of the mine explosions have demonstrated that if a certain amount of coal dust is mixed with air it forms a powerful explosive. Then why not apply this to the internal combustion engine of the present day type. However, if it is impossible to use this fuel in the engine before mentioned surely it could be used in some way in a steam power plant for motor cars and thus provide a cheap means of transportation. I would like to hear from someone on this subject.—N. H. Hormel.

As long ago as 1870 S. H. Roper, of Roxbury, Mass., made steam vehicles using coal; and in the 90's he applied a engine to a Columbia bicycle, using a fine grade of coal for fuel, being able to make a very good run as to mileage. Such fuel for steam cars might work out with automatic feed and bring results if it were not for the smudge which would be created, which would be so obnoxious that probably the authorities would prevent a vehicle of this type being operated on the public highways. It is doubtful if it could be used successfully in an internal combustion engine due to the difficulty of disposing of the ash, which would be somewhat plentiful. Still, it opens up a line for discussion.

#### WOODS MOBILETTE DETAILS

Q—What engine was used in the Woods Mobilette car?

2—Describe the oiling system used? Will this oiling system work at an angle suitable for marine use?

3—Did crankshaft extend beyond flywheel, and how far?

4—What type ignition was used?

5—How could a water pump be attached?—Henry Fink, Buckeye Lake, O.

1—Most of the engines used in the Woods Mobilette were of the Hermann make, manufactured by the Hermann Engineering Co., Detroit.

2—A combination pump and splash system was used, but the individual troughs are not deep enough to permit the engine being set at an angle. Nor should this be done. Build the engine bed so the engine will stand as nearly level as possible when the boat is under way.

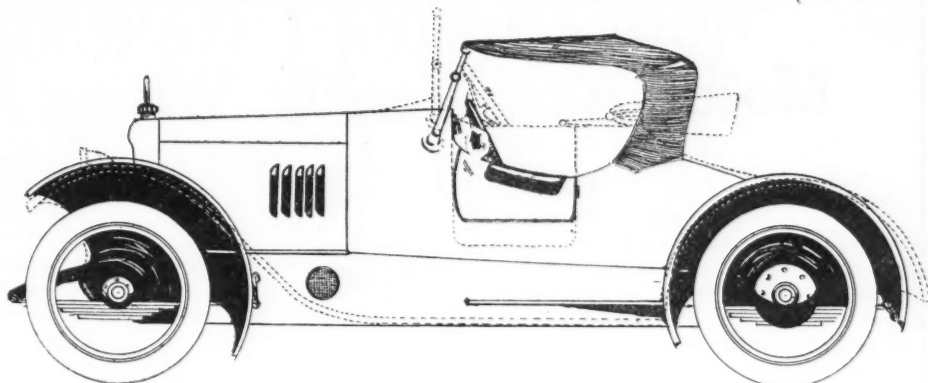


Fig. 16—Touring speedster design for Allen 37 chassis

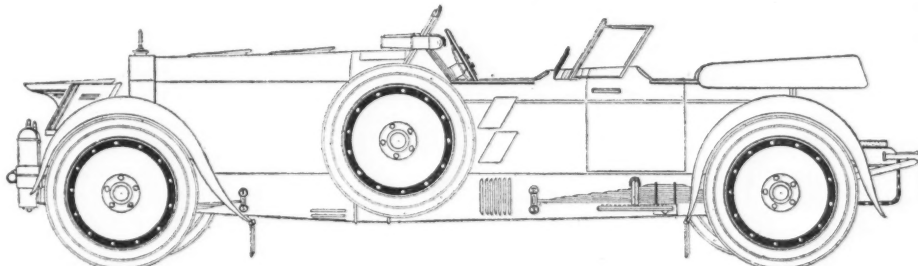


Fig. 17—Unusual car illustration submitted by Motor Age reader, Moreley F. Emmerson, Evanston, Ill.

Do not overlook the fact that the bow will rise and that if the engine is set level when the boat is at rest the engine will have too much angle when the boat is running. You can use a universal joint between the engine and propeller shaft. Then the oiling system will do nicely.

3—Yes; about 4 to 5 in.

4—A magneto was used for ignition, but several makes made up the list, for at times it was not possible to procure all needed of one make.

5—Use a centrifugal pump and operate it by a silent chain and one sprocket on the engine shaft and the other on the pump shaft. The pump can be located on a wooden bracket fastened to one of the bed members. The silent chain will work perfectly so long as you keep it lubricated with graphite-grease. It is customary in a boat to place the flywheel of the engine forward, so you will have the engine running anti-clockwise when looking toward the stern of the boat. This will bring the heavy end nearer the middle of the boat and will make for better trim. Of course you will have to have a thrust bearing between the universal joint and the packing gland at the stern-post in order to take the thrust of the propeller.

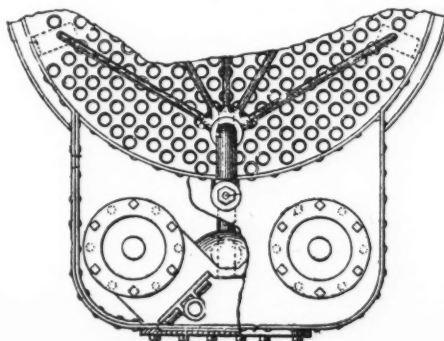


Fig. 18—Partial section of boiler used in Locomobile type of power plant

## Rebuilding

### SPEEDSTER BODY FOR ALLEN

Q—Publish speedster body for an Allen Model 37 with top windshield and give the approximate cost of building.

2—Publish racing body for a Model 8-88 Willys Knight; give approximate cost of building same.

3—Can Counterbalances be put on the crankshaft of a Willys Knight 8? If so, where can they be secured? Would you advise changing carbureters or will the Zenith be all right?—W. N. Grich, Reliable Auto Repair Co., Mexico, Mo.

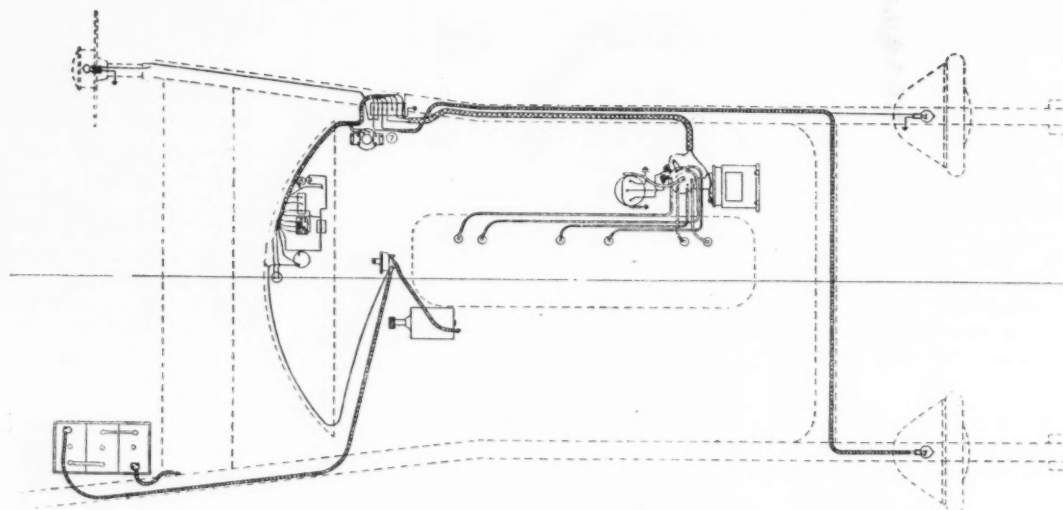
1—A suggestion such as you desire will be found in Fig. 16. Such a body, with full equipment, painted, should cost from \$200 to \$300. There is much variation in such jobs and a good deal depends upon who does the work.

2—This is shown in Fig. — and the approximate cost will be from \$150 to \$200.

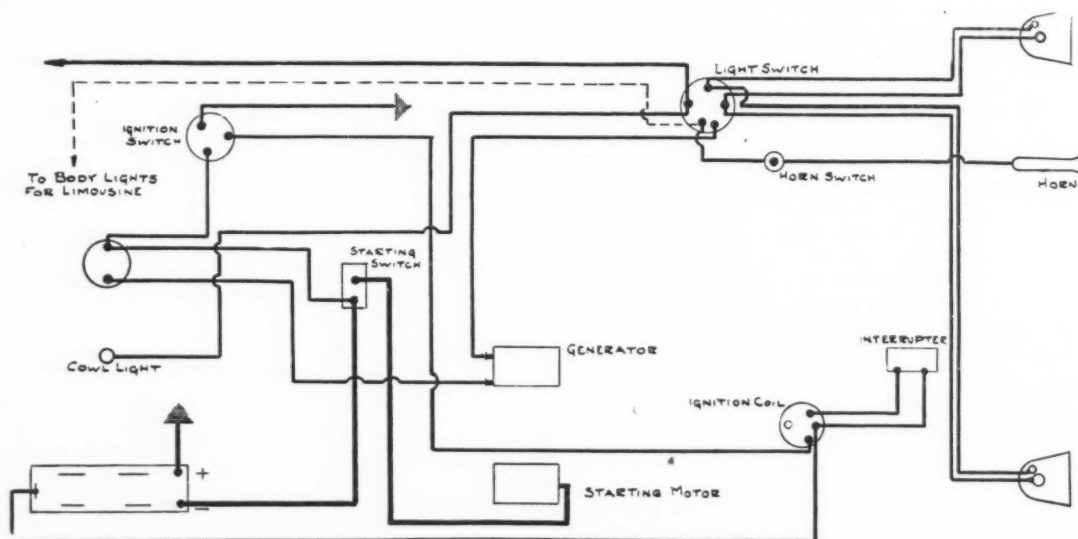
3—Possibly you can have a crankshaft with balances made but we do not think it is necessary and it will prove exceedingly expensive. Nor do you need a new carbureter. The Recardo Engine Co. makes a vibrating damper that can be fitted to the front crankshaft extension that might be worth while, but a careful adjustment of the carbureter for each cylinder block will probably put the engine in desirable shape. It is frequent that the two do not balance and this is what causes vibration. Adjust the right hand block first, cutting out the left side entirely. Adjust so the engine will turn over to show about twenty-five to twenty-eight sparks to each 15 sec., holding a watch in your hand to time by. Then cut out the right block and adjust the left to the same tune. If there is any spitting back, set the thermostatic valve closer to the radiator so it will heat more.



# Motor Age Weekly Wiring Chart No. 59



Mitchell 1916-'17-'18-'19 with Westinghouse starting and lighting and Connecticut ignition



1916-'17-'18 S. K. L. 4 Stearns-Knight 12 volt single wire Remy system

## THIS WEEK

Mitchell 1917 to 1919  
Stearns-Knight

Abbott—March 20-27, '19  
Alco—April 24, '19  
Allen—Dec. 18, '19  
Alter—Nov. 14, '18  
Apperson—March 6, '19  
Auburn—Nov. 27, '19  
Briscoe—Oct. 16, '19  
Buick—Nov. 21, '18; April 3, '19; Oct. 23, '19  
Cadillac—Dec. 19, '18  
Carters—May 1, '19  
Case—Oct. 2, '19  
Chalmers—Feb. 20, '19; March 27, '19; Nov. 27, '19  
Chandler—April 3, '19  
Chevrolet—Nov. 28, '18; March 27, '19  
Cole—Jan. 23, '19; April 3, '19  
Cutting—Nov. 6, '18  
Daniels—Dec. 4, '19  
Davis—May 8, '19; Dec. 4, '19  
Detroit—March 6, '19  
Dodge—Dec. 12, '18  
Dorris—Dec. 11, '19

Dort—March 13, '19  
Elgin—Feb. 27, '19  
Empire—March 13, '19; Oct. 30, '19  
Essex—Oct. 23, '19  
Ford—Jan. 30, '19; Feb. 6, '19; May 15, '19  
Franklin—June 19, '19; Dec. 11, '19  
General Battery Charging—May 29, '19; Sept. 25, '19  
General Magneto Diagram—June 5, '19  
Grant—Feb. 27, '19; March 27, '19  
Haynes—Sept. 4, '19; Oct. 9, '19  
Henderson—April 3, '19  
Hudson—Dec. 5, '18; May 1, '19  
Hupmobile—Feb. 13, '19; Oct. 16, '19  
Internal Connections—July 10-17-24, '19  
Interstate—March 13, '19  
Keeton—Nov. 6, '19  
King—July 3, '19  
Kissel—July 3, '19  
Krit—Feb. 6, '19  
Lexington—April 24, '19  
Liberty—Jan. 1, '20  
Little—March 20, '19  
Locomobile—Jan. 23, '19; April 17, '19  
Marmion—Jan. 9, '19; Dec. 25, '19  
Maxwell—Jan. 14, '19; Aug. 14, '19  
Marion—March 6-20, '19  
Mercer—Jan. 23, '19; Aug. 28, '19; Nov. 27, '19

Michigan—March 20, '19  
Mitchell—Jan. 9, '19  
Monroe—Oct. 30, '19  
Murray—May 1, '19  
National—June 19, '19  
Oakland—Jan. 2, '19; Oct. 16, '19  
Oldsmobile—Jan. 23, '19  
Overland—Nov. 7-14, '18  
Owen—Magnetic—Sept. 18, '19  
Packard—June 19, '19; July 31, '19  
Palge—July 3, '19  
Paterson—March 20, '19; June 26, '19; July 9, '19  
Pierce-Arrow—Oct. 2, '19  
Premier—April 10, '19; Dec. 18, '19  
Pullman—April 10, '19  
Regal—Feb. 6, '19; April 10, '19  
Reo—Feb. 27, '19; Aug. 21, '19; Oct. 9, '19; Nov. 13, '19  
Saxon—April 17, '19  
Scripps-Booth—Dec. 26, '18  
Simplex—April 17, '19  
Stanley—June 26, '19  
Stearns-Knight—April 24, '19  
Studebaker—Dec. 26, '18; Dec. 25, '19  
Stutz—Jan. 23, '19  
Velle—April 24, '19; Sept. 25, '19  
Westcott—May 8, '19  
White—Sept. 25, '19  
Special Systems for Fords—May 15-22, '19

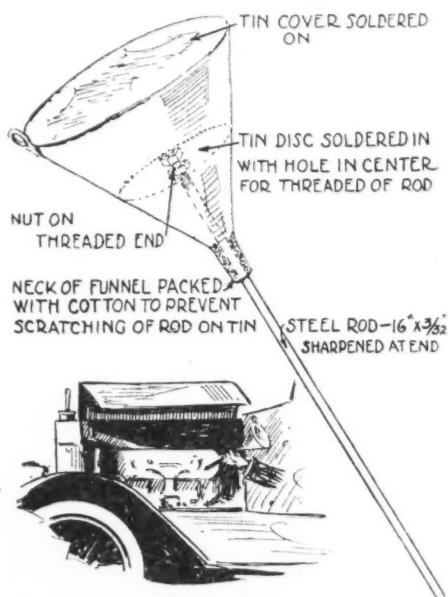
# The Motor Car Repair Shop

## Practical Maintenance Hints

### Engine Stethoscope

A simple stethoscope that has the advantage of being able to magnify the sounds much more than the ordinary type may be made from a small funnel and a threaded length of small steel rod with two nuts.

At the point shown in the cut, a small disc of thin tin is soldered to the inside of the funnel, with a hole in its center. The steel rod, sixteen inches long and 3-32 inch in diameter is then inserted and the two nuts put on and tightened as shown. Cotton is packed about the rod in the neck of the funnel, to prevent



Engine stethoscope

possible metal noise due to rubbing, from that source.

To complete the device, a circle of tin is soldered to the top of the funnel, making it air tight. It is well to place a little solder about the nuts on the rod, also, to insure its being airtight also.

It will be found that this device will magnify the sounds which are transmitted through the rod, when held against the engine, much more than some other types. To use, the rod is held against various parts that might be affected, until the sound becomes loudest.

### Light Guard for the Garage

In place of the usual wire bulb guard with which most trouble lights in public garages are equipped, one garageman improvised one out of an old tomato can which does the job as well, and has

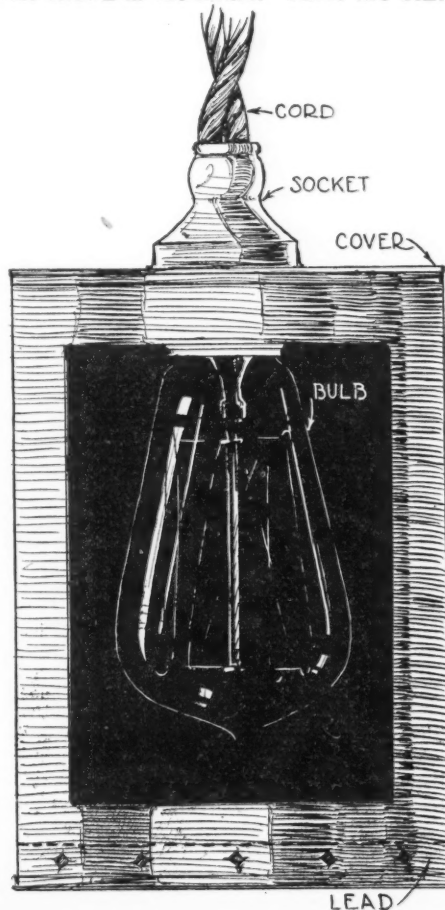
the advantage of being able to stand alone.

The cut shows how this was done. The side of the can was cut away, and the connection made through the top. A quantity of lead was melted and poured into the open end, after it had been placed on a smooth surface, and a few nail holes made to hold the lead in place.

### Testing Fuses

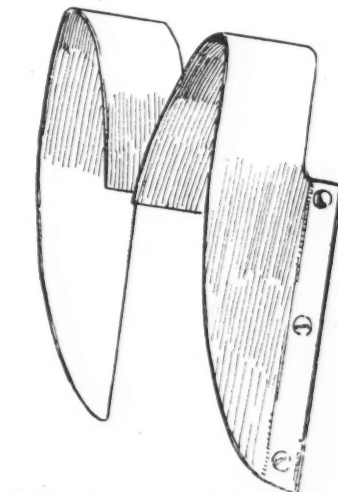
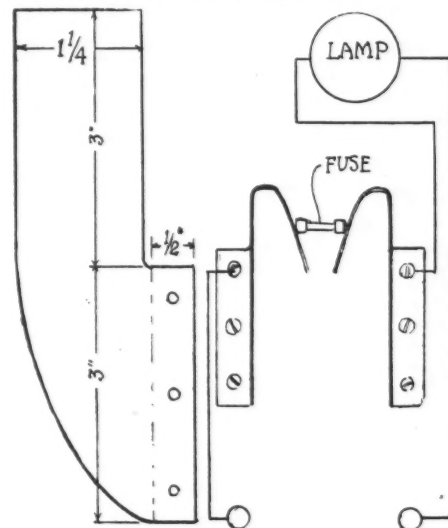
Another scheme that is very successful for testing fuses is made with two pieces of small spring brass, mounted on a neat wooden block, for the sake of appearance, and a 6-volt lamp. The illustration shows the method for using this device. If alternating current or direct current from the lighting circuit is used then a higher voltage lamp will of course be necessary. Incidentally, if the higher voltage circuit is used and the operator becomes careless there is a possibility that a shock will result. So we therefore recommend the 6-volt pressure only.

The brass strips are cut to the detailed size shown in the figure. These are bent



Light guard for the garage

so that the flat section with the holes in it can be secured to the mounting block. A lamp can be attached to the upper corner of the block so that when it flashes, it will be in plain sight. Suitable terminals can be improvised so that the storage battery leads will connect the tester in series with the lamp. To test the fuse, simply place it between the oblique bends of the strips and if the contacts of the fuses are reasonably clean, and the fuse good, the light will flash.



Device for testing fuses

### JIG FOR BURNING FORD BEARINGS

A jig for burning in Ford bearings can be made by taking a floating axle car, like that in a Dodge Bros. car, and make a jig to bolt the block on and take the flange off the left-hand wheel, reverse it and bolt a piece of iron across the back of it. Then fit the rack of the Ford crank so that the wheel can be turned with the crank. Start first in low speed and then go into high gear.—J. R. Jones, Gordonville Garage, Gordonville, Tex.



# Tire and Rim Sizes

## Motor Age Maintenance Data Sheet No. 71

One of a series of weekly pages of information valuable to service men and dealer—Save this page

### 1916 Cars (Continued)

CAR AND MODEL	Make of Tire	Size of Tire	Style of Bead	Type of Rim	Make of Rim
Saxon, 14-15		28x3		Clincher	Prudden
Scripps-Booth, C		30x3½		Clincher	Houk
Scripps-Booth, D		32x3½			Houk
Smp'lex 46 & 60		37x5			
Singer, 16	Goodyear	35x5	Clincher		
Spaulding		36x4			
Standard, E	Firestone	34x4		Firestone	Firestone
Stanley		34x4½		Q. D. C.	Firestone
Stearns-Knight, 4	Goodrich	34x4	Clincher	Type 72	Stanweld
Stearns-Knight, 8	Goodrich	35x4½	Clincher	Type 72	Stanweld
Stephens, 60		32x4	S. S.		Stanweld
Sterling		30x3½			
Studebaker, ED-6 & SF-4	Goodrich	34x4		Q. Dem. S. S.	Kelsey
Stutz, C		34x4			
Sun		34x4		S. S.	Firestone
Trumbull, 16-B		28x3			
Velie, 27	Goodyear	35x4¼		S. S.	Goodyear
Velie, 28	Goodyear	32x4		S. S.	Goodyear
Wayne		34x4			
		33x4			
Westcott, 41-42 & 51		34x4	Clincher		Firestone
White, G. A. H.		32x4		Q. D. C.	Firestone
White, G. E. D.		36x4½		Q. D. C.	Firestone
Winton, 22	Standard	37x5	Clincher	A.	Firestone
Winton, 22-A	Standard	36x4½	Clincher	A.	Firestone

### 1917 Cars

Abbott, 6-44		32x4		S. S.	Firestone
Aland, 14-60		33x4			
Allen		32x3½		S. S.	Firestone
American, A	Firestone	32x4		S. S.	Firestone
Ams-Sterling		30x3½		S. S.	
Anderson, 16-17	Federal	33x4	S. S.	Q. D.	Firestone
Apperson, 6-17	Goodyear Cord or	34x4	S. S.	Demountable	Firestone
Apperson, 8-17	Goodrich Cord	35x4½	S. S.	Demountable	Firestone
Arbenz		30x3½		Clincher	Firestone
Auburn, 6-39	Goodrich	34x4	S. S.		Firestone
Auburn, 6-44	Goodrich	35x4½	S. S.		Firestone
Austin		34x4½		Q. D. C.	Firestone
Bell, 17		31x4		Clincher	Firestone
Biddle, D	Goodrich Safety Tread or Firestone Non-skid	32x4	Q. D.	Q. D. C.	Stanweld No. 52
Bour-Davis, 17-B	Goodyear	33x4½	S. S.		
Brewster		34x4½		S. S.	Firestone
Briscoe, 4-24	Ajax	30x3½	Clincher	Clincher	Perlman
Buick, D-34 & D-35		31x4		Clincher	Baker
Buick, D-44, D-45, D-46 & D-47		34x4		S. S.	Baker
Cadillac, 55	Goodrich				
	U. S.	36x4½	S. S.	Dem. S. S.	Kelsey
	Kelly-Springfield				
Cameron		32x4		S. S.	
Case, T-40	Goodyear	34x4		Demountable	Goodyear
Chalmers, 6-30		32x4	S. S.	Demountable	Kelsey
		34x4			
Chandler, 17	Goodyear	34x4	Plain & Non-skid.	S. S.	Firestone
	Goodrich				
Charter Oak, A		35x5		Q. D. C.	Firestone
Chevrolet, 490		30x3½		S. S.	Perlman
Chevrolet, F-5 & F-2		32x3½		S. S.	Perlman
Chevrolet, D		34x4		S. S.	Perlman

#### ABBREVIATIONS:

S. S.—Straight Side. Q. D. C.—Quick Demountable Clincher. Dem.—Demountable. Q. D. D.—Quick Demountable Detachable.

# Tire and Rim Sizes

## Motor Age Maintenance Data Sheet No. 72

One of a series of weekly pages of information valuable to service men and dealer—Save this page

### 1917 Cars (Continued)

CAR AND MODEL	Make of Tire	Size of Tire	Style of Bead	Type of Rim	Make of Rim
Cole, 860		35x4½	S. S.	Demountable	
Crawford		32x4		Q. D.	Firestone
Crow-Elkhart, 33-C & 35-C	Firestone	32x3½		S. S.	Fisk and Firestone
Cunningham, V-2	Opt	35x5	Q. D.	Demountable	Firestone
Daniels, B	Goodyear	32x4½ 32x4½	Cord	S. S.	Firestone
Davis, 6-H		34x4		S. S.	Firestone
Davis, 6-J		34x4½		Q. D.	Firestone
Detroit, 6-45		33x4		S. S.	Kelsey
Dispatch, G		36x3½		Q. D. R.	Universal
Dixie Flyer, L.S.-35	U. S.	32x3½	S. S.	Firestone	
Dodge Brothers	Republic	32x3½	S. S.	S. S.	Kelsey
	U. S.	33x4			
	Goodrich				
Dorris, I-C-6	Goodyear	36x4½	S. S.	Q. D. D.	Firestone
	Firestone				
Dort, 6 & 9	Goodyear	30x3½	Clincher	Demountable	Detroit
Drexel, R-30-35		33x4			
Drexel		34x4			
Drummond, B-17		34x4		S. S.	Firestone
Elcar, D-E-F	Firestone	32x3½	S. S.	Type E	Firestone
Elgin, Series F	Firestone	33x4		S. S.	Firestone
	U. S.				
Emerson		30x3½			
Empire, 45		33x4		S. S.	Firestone or
Empire, 60-R & 70		34x4		S. S.	Stanweld
Enger		32x4		S. S.	Firestone
Fiat, 55-E-17		35x5			
Ford		30x3½	Clincher	Clincher	Ford
Franklin, Series 9	Goodyear	32x4	S. S.	No rim cut Detachable	Goodyear
F. R. P., 45-A & B		36x5		Q. D. C.	Wire Rudge
Geneva		34x4½			
Glide, 6-40	Goodyear	34x4	S. S.	Demountable	Goodyear
Grant, K		32x3½		S. S.	Firestone
Hackett		31x4			
HAL		34x4½		S. S.	Stanweld
Harroun		30x3½		Q. D. R.	Firestone
Hatfield, H		31x4			
Harvard, 2-T		28x3		Q. D.	
Haynes, 36 & 37	U. S.	34x4	S. S.	Light E	Firestone
Haynes, 40-41	Firestone	34x4½		No hook, wire wheel	Goodyear
	Goodyear	34x4½			
Hollier, 186		32x3½		S. S.	Firestone
Hollier, 178		34x4		S. S.	Firestone
Homer Laughlin, D		30x3½			
Howard		32x4			
Hudson, H. & J.		32x4½		S. S. & Clincher	Kelsey
		35x4½			
Hupmobile, N	Goodyear	32x4	S. S.	Demountable	Firestone
Inter-State, T		33x4			
Jackson, 349		34x4		S. S.	Detroit
Jeffery, 671	Goodyear	34x4		S. S. Dem	Stanweld
Jones, 26	Miller	34x4	Gear Road	S. S.	Firestone
Jordan, B	Firestone	34x4	S. S.	E light	Firestone
Kent, A		32x4			
King, E, E, & F	Goodyear	34x4	Non-skid	Demountable	Stanweld
	Firestone				
Kissel Kar, 6-42		34x4		S. S.	Firestone
Kissel Kar, 100 Pt. Six		32x4		S. S.	Firestone
Klinekar, 6-38-F	Goodyear	34x4	S. S.	E light	Firestone

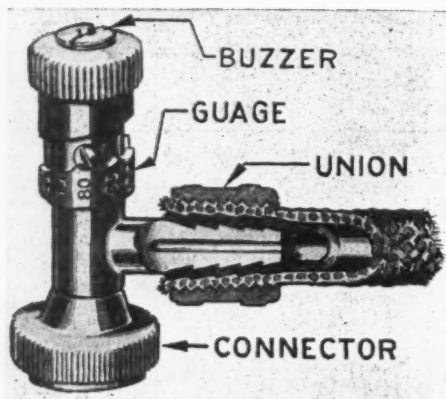
#### ABBREVIATIONS:

S. S.—Straight Side. Q. D. C.—Quick Demountable Clincher. Dem.—Demountable. Q. D. D.—Quick Demountable Detachable.



# Service Equipment

## Time Savers of the Shop



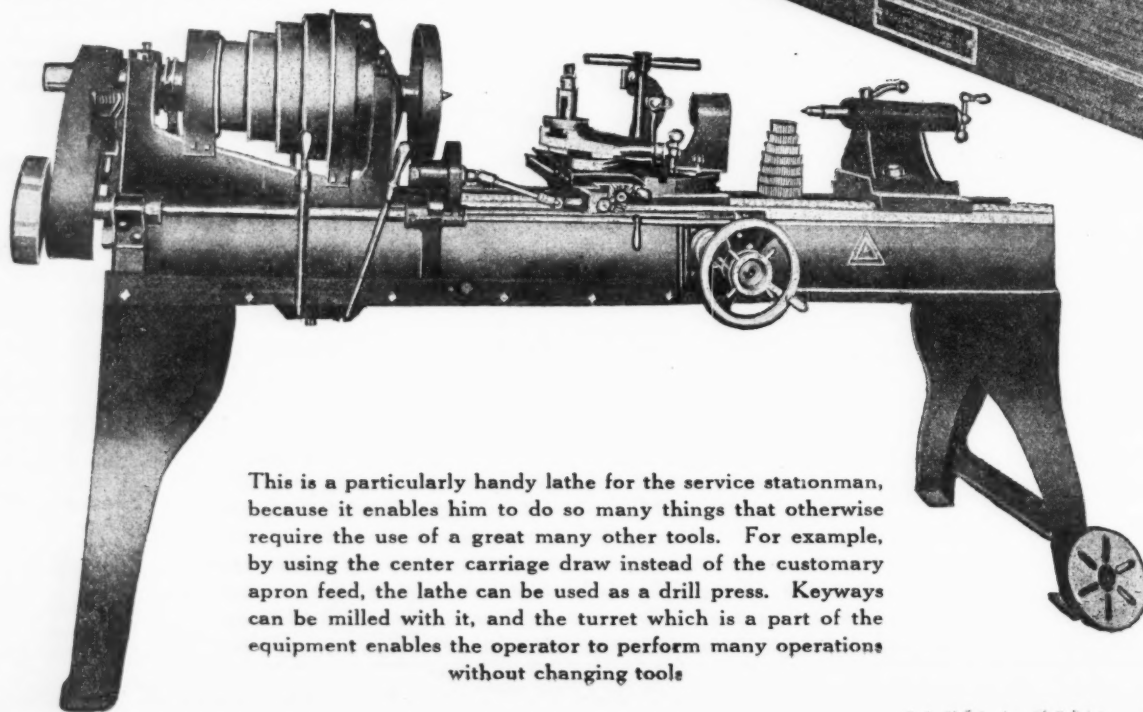
Hilton safety tire gage

### Hilton Safety Tire Gage

The Hilton safety tire gage shown in the illustration is a combination of an air hose connector, a tire gage and a warning signal that buzzes when the tire is inflated. The gage is set to the proper pressure for the tire before it is connected to the tire valve. Then when the tire is inflated to this pressure the safety arrangement releases the excess air and causes the signal to buzz. This device is made by the Mead Engineering Co., 1133 Broadway, New York City.

### Tyler Lathe

Every shop specializing in good mechanical service needs a lathe. The one shown in the illustration is the product

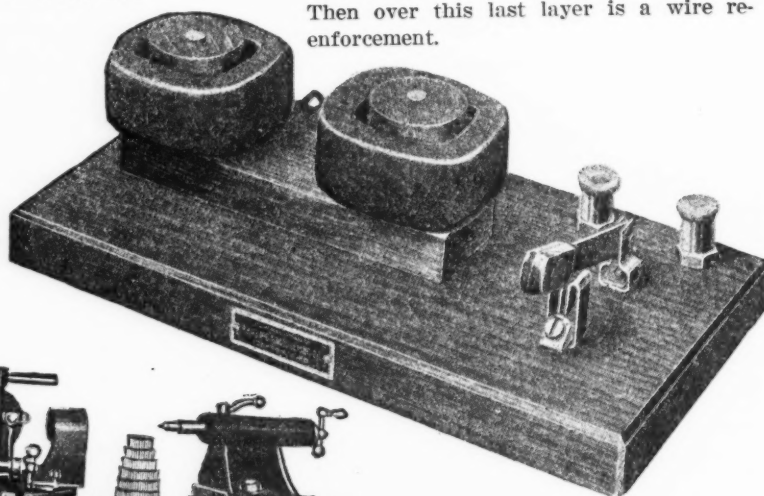


This is a particularly handy lathe for the service stationman, because it enables him to do so many things that otherwise require the use of a great many other tools. For example, by using the center carriage draw instead of the customary apron feed, the lathe can be used as a drill press. Keyways can be milled with it, and the turret which is a part of the equipment enables the operator to perform many operations without changing tools

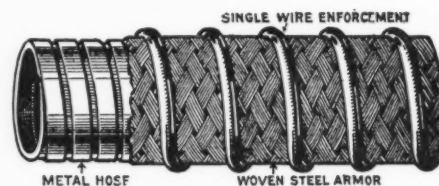
of T. Tyler Boggs & Co., 201 No. Broad St., Philadelphia, Pa. The driving pulleys have four belt cones for changing the speed of the machine for the different grades of work. Complete gears are furnished for screw-cutting for changing the speed of the lead screw. The tool holder is of the compound type and can be turned to any angle for the cutting of tapers.

### Phillips Magnet Charger

The Phillips magnet charger is a handy electrical contrivance that enables one to charge the magnets of the magneto. The current supply is taken from a storage battery connected to the two terminals on the block. The operation of charging is very simple with this magnetizer. First the battery is connected up, the magnet placed across the pole pieces of the coils and the switch is then opened and closed several times. The device is made by H. E. Phillips & Co., Union City, Ind.



Above is illustrated the Phillips magnet charger for charging the magnets of the magneto. The current supply is taken from a storage battery connected to the two terminals on the block



### Metal Air Hose

In these days of high air pressures for pneumatic tired trucks, the free air line of the service station is apt to suffer much injury unless the hose is made strong enough to resist the pressure and the rough usage. The hose shown in the illustration is a good example of the type needed for the work. This particular one is made by the Breeze Mfg. Co., Newark, New Jersey. The inner section of this hose is of metal and is flexible. Covering this flexible metal hose is a woven steel armour protecting layer that adds considerably to the strength of the hose. Then over this last layer is a wire re-enforcement.

# The Accessory Corner

## New Fitments for the Car

### Brookins Explosion Whistle

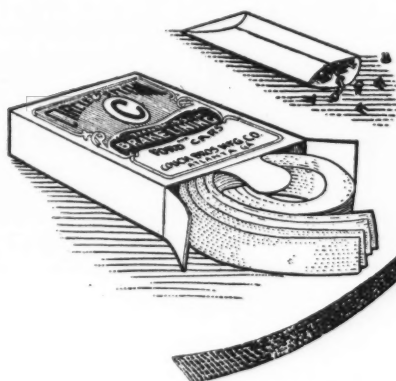
The Brookins explosion whistle is an automatic warning signal that sounds only on the explosion stroke of the cylinder. A ball check valve is contained in the construction which serves a two-fold purpose. This valve prevents air from being drawn into the cylinder on the intake stroke, which would otherwise destroy the burning quality of the mixture, and the second function is that compression within the cylinder is maintained up to 60 lb. when the explosion releases the ball check and blows the whistle. This whistle is made by the Brookins Mfg. Co., Dayton, Ohio.

### Anco Hot-Spot

This is a special manifold for the Ford car designed to completely volatilize and help the engine to burn low grade fuel. It is easily placed on the Ford engine with the aid of a wrench and replaces the exhaust and intake manifold. The principal of operation which is clearly explained in the illustration is in the thin metal wall that separates the intensely hot exhaust gases from the comparatively cold intake gases. One spot on this wall is particularly hot and against this the intake gases are hurled with a great velocity, thus tending to thoroughly break up the fuel particles. This manifold is made by the Anderson Co., South Bend, Ind.

### Standex Gasoline Gage

The Standex gasoline gauge for Ford cars enables the driver to tell at a glance the number of gallons in the tank. The gage is very simple in construction and has few parts to get out of order, and is so constructed that the filler cap of the regular Ford tank is removed and



Circle C brake lining for the transmission bands of the Ford

the gasoline gage screwed into its place. The filler cap is placed on the side of the dial so that it is not necessary to disturb the gage every time fuel is taken on. This gage, listed at \$2.50, is made by the Standex Mfg. Corp., 341-345 East Ohio street, Chicago.

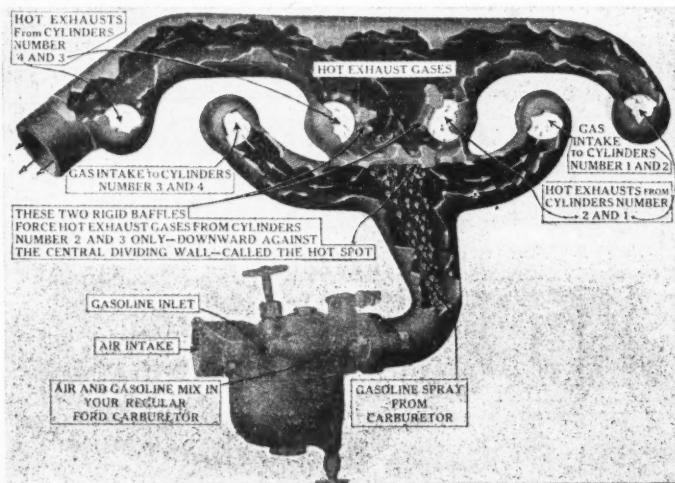
### Circle C Brake Lining

Circle C is the name of a brake lining intended for the transmission bands of the Ford car. This lining contains no wire and is composed wholly of long fiber material impregnated and hardened with a compound said to resist the hot, oily condition in the Ford transmission. It is impervious to oil, grease, dirt, water and gasoline. It is packed in boxes of one set to the box complete with rivets, or in rolls of 100 ft. The concern also makes Non-Squeak treated body webbing 1 in. in diameter, in rolls of 100 ft. Perfection hood lacing is another product of this company and this material comes ½ in. wide and in rolls of 100 ft. Webbing for every possible use in the automotive industry is also to be had in plain white, dyed or treated. Besides making woven fabric

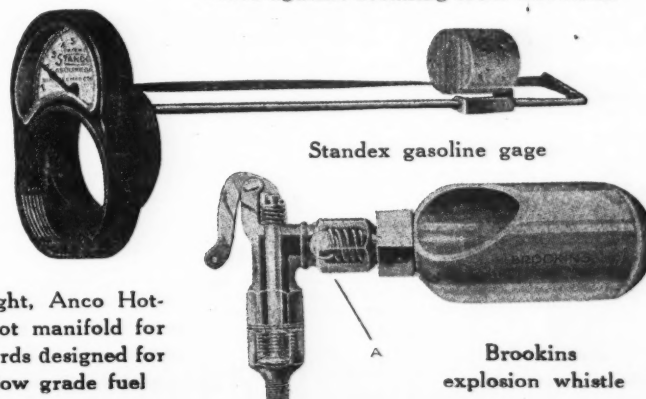
materials the company specializes in axle and drive shafts for Fords and Chevrolet cars. The makers are Couch Bros. Mfg. Co., Atlanta, Ga.

### Speedcop Rear View Mirror

One of the latest things in the accessories line is a rear-sight mirror, known as the "Speedcop," which is being manufactured by the Hillcrest Motor Co. of 6724 Hollywood Boulevard, Hollywood, Cal. Unlike other rear-sight mirrors, the speedcop is constantly before the driver's eyes, being attached to the top of the windshield frame, inside of the car, answering the purpose, as the manufacturers say, of putting "eyes in the back of your head." The advantage of its use is that it is not necessary for the driver to divert his glance from the road before him in order to see the traffic approaching from the rear, as the reflection in the "Speedcop" is included in his driving range. The reflection is obtained through the window in the rear of the car, and the mirror is equally adaptable to either closed or open cars. It is an attractive little appliance, made of best quality plate glass, 3 by 12 in., mounted in a handsome nickel-plated frame with a light but substantial adjustment, which permits of permanent adjustment, and insures against breaking from vibration.



Right, Anco Hot-Spot manifold for Fords designed for low grade fuel



Standex gasoline gage

Brookins explosion whistle



These tables are revised and brought up to date monthly

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### Motor Age Monthly Motor Truck Specifications — Concluded

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# From the Four Winds

## Glimpses at the World of Motordom

### Coming Motor Events

#### AERONAUTIC SHOWS

Chicago	Chicago Aircraft Exposition	Jan. 8 to 14
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#### AUTOMOBILE SHOWS

New York	National Automobile Chamber of Commerce	Jan. 3 to 10
Philadelphia	Phil. Automobile Trade Ass'n	Jan. 10 to 17
Wilmington, Conn.	State Armory	Jan. 16 to 18
Montreal	Motordrome, V. Leverque, Mgr.	Jan. 17 to 24
Hazleton, Pa.	Chamber of Commerce	January
Topeka, Kan.	Annual Automobile Show	January
Oakland, Cal.	Alameda Trade Ass'n	Jan. 19 to 26
Cleveland, O.	Cleveland Automobile Mfrs. & Dealers' Ass'n	Jan. 17 to 24
Hartford, Conn.	Hartford Automobile Dealers' Ass'n	Jan. 17 to 24
Schneetady, N. Y.	James J. Callahan, Manager	Jan. 19 to 24
Milwaukee, Wis.	Annual Show, B. J. Buddle, Manager	Jan. 19 to 25
Spokane, Wash.	Spokane Dealers' Automotive Show	Jan. 21 to 25
Chicago	National Automobile Chamber of Commerce	Jan. 24 to 31
Chicago	Automobile Salon	Jan. 24 to 31
Amsterdam, N. Y.	New York State Armory	Jan. 26 to 31
Kansas City	Overland Bldg., E. E. Peake, Mgr.	Jan. 31 to Feb. 6
New Brunswick, N. J.	Annual Show, W. A. Kuehn, Mgr.	Jan. 31 to Feb. 7
Minneapolis, St. Paul	Minn. Automobile Trade Ass'n	Jan. 31 to Feb. 7
Toledo, O.	Terminal Auditorium	Feb. 2 to 7
Rochester, N. Y.	Rochester Auto Trades Ass'n	Feb. 2 to 7
Baltimore, Md.	Automobile Show	Feb. 3 to 7
Wilmington, Del.	Hotel DuPont	Feb. 3 to 8
Charlotte, N. C.	Charlotte Automobile Trade Ass'n	Feb. 9 to 14
Greenfield, Mass.	Mass. State Armory	Feb. 9 to 14
New Haven, Conn.	Automobile Dealers' Ass'n	Feb. 9 to 14
Nashville, Tenn.	Automobile Show	Feb. 9 to 14
Salt Lake City	Automobile Show	Feb. 9 to 14
Cedar Rapids, Iowa	Automobile Show	Feb. 9 to 14
Deadwood, S. C.	Deadwood Business Club	February
Brooklyn, N. Y.	Motor Vehicle Dealers' Ass'n	Feb. 14 to 21
Detroit, Mich.	Detroit Automobile Dealers' Ass'n	Feb. 14 to 21
Des Moines, Ia.	Herring Motor Co.	Feb. 16 to 21
Buffalo, N. Y.	Buffalo Automobile Dealers' Ass'n	March 1 to 6
St. Louis	St. Louis Automobile Mfrs. & Dealers' Ass'n	Feb. 15 to 20
Manchester, N. H.	Automobile Show, Academy	Feb. 16 to 20
San Francisco	San Francisco Motor Car Dealers' Ass'n	Feb. 21 to 28
Ottawa, Canada	Motor Show	Feb. 21 to 28
Bethlehem, Pa.	Sixth Annual Show, J. L. Ellieot, Mgr.	Feb. 23 to 28
Louisville, Ky.	Louisville Automobile Dealers' Ass'n	Feb. 23 to 28
Pittsfield, Mass.	Mass. State Armory	Feb. 23 to 28
Portland, Ore.	Portland Automobile Trade Ass'n	Feb. 23 to 28
Grand Rapids, Mich.	Automobile Show	Feb. 23 to 28
Wichita, Kan.	Automobile Show	Feb. 23 to 30
Columbus, Ohio	Memorial Hall	Feb. 24 to 28
Newark, N. J.	First Regiment Armory, C. E. Holgate, Mgr.	Feb. 28 to Mar. 6
Perth Amboy, N. J.	First Automobile Show	March 1 to 6
Springfield, Mass.	Springfield Automotive Dealers' Ass'n	March 1 to 7
Lyons	Automobile Show	March 1 to 8
Syracuse, N. Y.	Syracuse Automobile Dealers' Ass'n	March 1 to 6
Denver	Denver Automobile Trade Ass'n	March 2 to 6
Lancaster, Pa.	Automobile Show	March 3 to 6
Jersey City, N. J.	Automobile Show	March
Boston, Mass.	Mechanics' Bldg., C. D. Campbell, Mgr.	March 13 to 20
New Orleans	Automobile Show	March
Little Rock, Ark.	Annual Show, Liberty Hall	March 15
Oklahoma City, Okla.	Oklahoma City Dealers' Ass'n	March 15
Wilkes-Barre, Pa.	Passenger Car & Truck Show	March 15 to 22

#### TRUCK SHOWS

New York	National Automobile Chamber of Commerce	Jan. 3 to 10
Philadelphia	Commercial Museum	Jan. 17 to 24
Chicago	National Automobile Chamber of Commerce	Jan. 24 to 31
New Haven, Conn.	Automobile Dealers' Ass'n	Feb. 16 to 21

#### TRACTOR SHOWS

Wichita, Kan.	Wichita Thresher-Tractor Club	Feb. 9 to 14
Kansas City, Mo.	Kansas City Tractor Club	Feb. 16 to 21

#### MISCELLANEOUS CONVENTIONS AND MEETINGS

Chicago	Highway Transport Conference	Jan. 24
Chicago	N. A. D. A.	Jan. 26 to 27
Atlanta, Georgia	Automobile Dealers' Ass'n Convention	Jan. 27
Atlanta, Georgia	National Ass'n of Automobile Show Managers	Jan. 27
Chicago	Society of Automotive Engineers	Jan. 28
Louisville, Ky.	Seventeenth Annual Convention American Road Builders' Ass'n; Tenth American Good Roads Congress and Eleventh National Good Roads Show	Feb. 9 to 13
Lake Charles, La.	Louisiana-Mississippi Automotive Trade Ass'n Convention	March 17 to 18

**No Spotlights in Canada**—Canada now has a law providing a \$50 fine for the transfer of a license from one car to another. If a car is sold the license must go with it. Another law provides a fine for having a spot or pivot lights on an automobile in Canada.

**Philadelphia Adds Motorized Fire Equipment**—Philadelphia's motorized fire-fighting apparatus soon will be augmented by fifteen engines, six combination chemical and hose trucks and two hook and ladder trucks, the whole to cost approximately \$300,000.

**Louisiana Building Roads**—Louisiana is to have three directors on the board of the Lee Highway Association, recently incorporated at a meeting of three hundred delegates at Roanoke, Va. The object is to construct a hard-surfaced highway from Gettysburg, Pa., to New Orleans.

**Vote \$200,000 for Roads**—Webster county, Louisiana, has just sold \$200,000 good roads bonds, bearing 5½ per cent interest, to the Canala Bank and Trust company, of New Orleans. The issue was authorized last May, the county voting as a unit, instead of by road districts as usual.

**Tanks at Rock Island**—The Rock Island, Illinois, arsenal has been designated by the war department as the center of manufacture, storage, and distribution of tanks and tractors. According to Col. L. B. Mood, an office in charge of the tank, tractor and trailer division of the ordnance department, tanks and tractors are not only effective machines of warfare, but they are the most economical reserve force of an army in peace.

**Road-building Costs High**—Sealed bids for the construction of 27.05 miles of graveled roads in two parishes of Louisiana were opened Dec. 22, by the state highway engineer. Bids for 73 miles had been advertised, but the high cost of material and the uncertainty of getting labor showed itself when only two bids, and those on only 27 miles, were received. According to the bids, the cost will be about \$12,000 a mile, approximately \$4,000 a mile more than the cost of similar roads in 1916.

**Operate Three Truck Mail Routes**—The successful operation of three motor truck routes is reported by the Postmaster General in his annual report. The service has been operated for the conduct of experiments in truck service, being designed primarily to promote the conservation of farm products and facilitate their delivery and collection. When the service was first utilized, an effort was made to maintain it through connecting trunk-line routes, which policy was abandoned as being impracticable and the operations have been curtailed, and are now confined to given localities. The advantages of this service justify its continuance and extension.

The report emphasizes the importance of the construction of good roads to enable the postal service to extend motor truck routes.